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United States
Department of
Agriculture

July 1995

1993 Report on USDA Human Nutrition Research and Education Activities

A Report to Congress

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U.S. Department of Agriculture. 1993 Report on USDA Human Nutrition Research and Education Activities: A Report to Congress. U.S. Department of Agriculture, 72 pp.

This report was prepared under the auspices of the U.S. Department of Agriculture's Human Nutrition Coordinating Committee, under the Human Nutrition Program Policy Committee of the Secretary of Agriculture's Policy Coordination Council.

Except where noted, the agency names used in this report were those in effect before the 1994 USDA reorganization.

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Abbreviations

AMS	Agricultural Marketing Service (USDA)
ARS	Agricultural Research Service (USDA)
ASFSA	American School Food Service Association
CDC	Centers for Disease Control (DHHS)
CES	Cooperative Extension Service
CSFII	Continuing Survey of Food Intake of Individuals
CSRS	Cooperative State Research Service (USDA)
DGAC	Dietary Guidelines Advisory Committee
DHHS	Department of Health and Human Services
DOC	Department of Commerce
EFNEP	Expanded Food and Nutrition Program
EPA	Environmental Protection Agency
ERS	Economic Research Service (USDA)
ES	Extension Service (USDA)
FDA	Food and Drug Administration (DHHS)
FNIC	Food and Nutrition Information Center
FNS	Food and Nutrition Service (USDA)
FSIS	Food Safety and Inspection Service (USDA)
FSP	Food Stamp Program
HNIS	Human Nutrition Information Service (USDA)
NAS	National Academy of Sciences
NASS	National Agricultural Statistics Service (USDA)
NCHS	National Center for Health Statistics (DHHS/CDC)
NFCS	Nationwide Food Consumption Survey
NIH	National Institutes of Health (DHHS)
NFSMI	National Food Service Management Institute
NLEA	Nutrition Labeling and Education Act
NMFS	National Marine Fisheries Service (DOC)
NNMRRP	National Nutrition Monitoring and Related Research Program
NSLP	National School Lunch Program
OCA	Office of the Consumer Advisor (USDA)
OPA	Office of Public Affairs (USDA)
USDA	United States Department of Agriculture
WIC	Women, Infants, and Children

Executive Summary

In accordance with the provisions of section 1452(b) of the National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (7 U.S.C. 3173 note), this report on the human nutrition research and education activities of the U.S. Department of Agriculture for fiscal year (FY) 1993 is hereby submitted. This is the seventh annual report in which directions and highlights are emphasized without restating the Department's detailed plan outlined in the report submitted in 1986.

New human nutrition research projects initiated, research highlights, and other research findings during FY 1993 for USDA agencies are presented by research areas as follows:

- Normal Requirements for Nutrients
- Role of Nutrition in Promoting Health and Preventing Diet-Related Disorders
- Food Composition and Nutrient Bioavailability
- Food and Nutrition Monitoring Research
- Government Policies and Socioeconomic Factors
- Food and Nutrition Information and Education Research
- Food Marketing and Demand.

The numbers of USDA research projects included in the Human Nutrition Research Information Management System in 1993 are shown by Federal nutrition code category. The food and nutrition information and education programs within USDA also are summarized by new initiatives and ongoing programs to meet their clients' needs.

Human nutrition research and education activities in USDA continued to be linked with the nutritive value of foods, human nutritional needs, the kinds and amounts of foods that Americans consume relative to their needs, and strategies for improving diets and the food supply. The major role of USDA is to help individual consumers understand the relationship of food and its nutrients to the maintenance of health and the prevention of diet-related disorders during the different stages of life. Because consumers' demands drive the marketplace, the importance of sound, research-based nutrition education programs for consumers, as well as for food producers and processors, is obvious.

The actual or estimated expenditures for human nutrition research, monitoring, and education by several USDA agencies for fiscal years 1986-1994 are given (tables 2-6). The total amount of human nutrition research and monitoring support by USDA increased from \$60.7 million in FY

1986 to \$75.9 million in FY 1993, an increase of 25 percent. During the same period, USDA support for human nutrition education increased 103 percent, from \$132.1 to \$267.6 million. Most of the funds for education activities were distributed to State health and nutrition agencies. The total USDA support for human nutrition research, monitoring, and education in FY 1993 was \$343.5 million.

Coordination within USDA during 1993 continued to be through the Human Nutrition Coordinating Committee (formerly the Human Nutrition Subcommittee) under the structure enacted in January 1993. Coordination between USDA and other agencies was facilitated by the major interagency groups, the Interagency Board for Nutrition Monitoring and Related Research, and the Interagency Committee for Human Nutrition Research. Coordination with the private sector was through many working groups and advisory groups, described in section V.

Benefits

Many discoveries of nutrient composition of food, indicators of nutritional status, and ways of delivering useful information to the public occurred in 1993. New efforts were made to link basic information to information delivery systems. Exploration of the potential to more effectively enable people to improve their dietary habits and nutritional status by greater efforts at nutrition intervention and behavioral research was begun. Nutrition information and education reached many additional families through public use of the Food Guide Pyramid and expansion of direct services in three areas: (1) basic WIC nutrition education, (2) the ES/WIC nutrition education initiative, and (3) the expansion of Food Stamp Program (FSP) nutrition education activity. The American public and the global community can use the nutritionists and dietitians at the Food and Nutrition Information Center to gain access to the world's literature and ask general questions about food and human nutrition. Electronic technology, for example, online data bases, CD-ROM, Internet, and bulletin board systems, allow center staff to link users of the center with information that may not be readily available to them.

FSIS's promulgation of regulations for nutrition labeling of foods is intended to ensure that consumers have available accurate and comprehensive information on which to base their food selections. FSIS and FDA worked to harmonize nutrition labeling so that the information provided to consumers on food products regulated by the two agencies are as consistently presented as possible. The new nutrition label provides nutrient composition and serving size

information to consumers and facilitates the comparisons of nutritional qualities of products within and among food categories. Additionally, the manufacturers' requirement for and the consumers' use of nutrition labels should act as an important incentive to manufacturers to improve the nutritional qualities of existing and new food products. The nutrient information, the standardization of serving sizes, and the presentation of Daily Values provided by nutrition labeling on the great majority of available food products should serve to improve consumers' awareness of nutrition in general as an important component in making food choices. It is expected that with informative, systematic nutrition labeling of food, accompanied by educational efforts on this and other aspects of dietary guidance, substantial health benefits will accrue to the American population.

AMS programs help the private marketing system operate quickly, efficiently, dependably, economically, and fairly. This ensures that food shoppers continue to have a wholesome, high quality, abundant, and reasonably priced food supply available. Educational materials developed by AMS about quality food grades and grading services provide food shoppers with dietary guidance. More fresh produce, more products with lowered fat, sodium, and sugar, and a greater variety of further-processed products with "kid appeal" are distributed by AMS to schools and other eligible institutions. By collecting food samples and analyzing them for residues, AMS contributes to Federal programs that set pesticide tolerance levels.

1993 Report on USDA Human Nutrition Research and Education Activities: A Report to Congress

I. Introduction

A. Charge

In accordance with the provisions of section 1452(a) of the National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (7 U.S.C. 3173 note), a U.S. Department of Agriculture comprehensive plan for implementing a national food and human nutrition research and education program was submitted to Congress in December 1986. Section 1452(b) of this act requires the Secretary, annually thereafter, to submit a report on the USDA human nutrition research activities. Such reports, prepared under the auspices of USDA's Human Nutrition Coordinating Committee under the Human Nutrition Policy Committee of the Secretary's Policy Coordination Council, were submitted for 1987, 1988, 1989, 1990, 1991, and 1992. This report covers the Department's activities in human nutrition research and education for 1993. As before, emphasis is given to new directions and accomplishments during the year. The 1986 report gives the detailed program plan components.

B. Legislative

1. Nutrition Labeling

Public Law 101-535, the Nutrition Labeling and Education Act (NLEA), was passed by Congress and signed into law by the President in 1990. This law amends the Federal Food, Drug, and Cosmetic Act and, in part, requires mandatory nutrition labeling for most packaged food products regulated by the Food and Drug Administration (FDA). Although meat and poultry products were not covered by NLEA, USDA promulgated regulations for nutrition labeling of meat and poultry products that fall under the Department's jurisdiction.

• Nutrition Labeling Regulation

USDA's Food Safety and Inspection Service (FSIS) published a final rule in the Federal Register on January 6, 1993, for the nutrition labeling of meat and poultry products. The final rule permits voluntary labeling on single-ingredient, raw meat and poultry products and establishes mandatory nutrition labeling for most all other meat and poultry products, with certain exceptions. The effective date was July 6, 1994.

C. Changes in Resources or Infrastructure

On October 7, 1993, Secretary of Agriculture Mike Espy announced that USDA would be reorganized along six mission lines. To reflect the importance of USDA's food and nutrition programs, he proposed that the Assistant Secretary for Food and Consumer Services be elevated to Under Secretary for Food, Nutrition, and Consumer Services. The existing coordinating mechanisms for nutrition education and research in the Department would be modified as alignment of the six mission lines was developed. Assistant Secretaries for Marketing and Inspection Services and Research and Economics, as well as the programs under the Under Secretary for Food, Nutrition, and Consumer Services would have areas of program responsibility. The organization structure was presented to Congress.

• U.S. Nutrition Plan of Action

In follow-up to the December 1992 International Conference on Nutrition, the Assistant Secretary for Food and Consumer Services took the lead for USDA in guiding development of the U.S. Plan of Action for Nutrition. Public input toward the plan was requested in a Federal Register notice dated July 1, 1993. A public meeting to obtain additional input was held on August 4, 1993, and was cochaired by the U.S. Agency for International Development, the Department of Health and Human Services, and USDA. An interdepartmental steering committee, including members from each of these three agencies, was established to coordinate development of the plan. In 1993, the numerous interdepartmental working groups established by the steering committee developed brainstorming-type concept papers to provide ideas for consideration by policy officials in development of the plan. When final, the U.S. Plan of Action for Nutrition will be submitted to the Food and Agricultural Organization of the United Nations and to the World Health Organization.

II. Human Nutrition Research Activities

A. General

Human nutrition research and education activities in USDA are linked with determining the nutritive value of foods, human nutrient needs, the kinds and amounts of foods that Americans consume relative to their needs, and strategies for improving diets and the food supply. As knowledge grows of the relationship of the type of foods consumed to resistance to chronic and infectious diseases, the attention that USDA gives to understanding the relationship of food and its nutrients to health promotion in individuals increases.

New nutritional knowledge has led to changes in kinds and amounts of foods people consume and thus the demand for food. Improvement of the nutritional quality of the foods we eat involves changes in agricultural and food processing systems. The nutritional well-being of individuals and population groups depends on all the factors that occur in the "food chain" before food becomes available for consumption, that is, during production, processing and storage, and marketing. In recent years, new types of foods that have improved characteristics for nutrient content, bioavailability and reduction of undesirable quantities of fat, saturated fat, and sodium have been introduced.

To ensure an adequate supply of high-quality foods, an intimate knowledge of food composition, of the biological effects of food constituents, and of nutritional requirements and tolerances of humans is needed. This knowledge can be derived only through interdisciplinary efforts, connecting nutrition research with pre- and postharvest agricultural science and technology. The value of the knowledge is achieved by educating the public and encouraging people to adopt the most healthful food habits.

The human nutrition research activities during 1993 are presented under six areas as detailed in the national plan. These are

- normal requirements for nutrients
- role of nutrition in promoting health and preventing diet-related disorders
- food composition and nutrient bioavailability
- food and nutrition monitoring research
- food and nutrition information and education research
- research on government policies and socioeconomic factors.

USDA conducts research on the role of nutrients in the reduction or prevention of nutrition-related disorders and the promotion of robust health throughout life. The research programs are not directed to treatment of disease. The focus is on normal nutrient requirements and content and bioavailability of nutrients in foods.

In December 1993, a computer search was made of ongoing research in USDA relating to human nutrition, using the Human Nutrition Research Information Management System (HNRIMS). Table 1 shows the number of USDA research projects in most of the nutrition code categories under each of the six research areas listed for fiscal year 1991. The table also shows the percentage of the total number of USDA projects that were coded for each of the categories. In addition, the percentage of the total number of research projects in HNRIMS for all Federal agencies that are USDA-supported projects is given by nutrition code category. The USDA projects include those conducted by the USDA agencies, the State agricultural experiment stations, and the 1862 and 1890 land-grant institutions and

Tuskegee University. Some of these projects receive no Federal funds.

The Agricultural Research Service (ARS) is USDA's principal research agency. Its research on human nutrition is conducted largely at five human nutrition research centers and at five regional research centers. The National Program Staff coordinates the research programs. Each center has different research objectives and contributes to solutions of high-priority national problems. The human nutrition research centers are listed following:

Beltsville Human Nutrition Research Center, Building 308, BARC-East, Beltsville, MD 20705; Dr. Joseph Spence, director, (301) 504-8157. Its history can be traced to 1894 when Federal funds were provided for nutrition research at Wesleyan University in Middletown, CT. It moved to Washington, DC, in 1906 and to Beltsville, MD, in 1941. Research is conducted to define the role of food and food components in reducing the risk of nutritionally related disorders among Americans. The research includes nutrient composition and nutritional qualities of food, human performance in relation to energy and nutrient requirements, and functions and interactions of nutrients in foods. Dietary strategies are developed that can delay the onset of nutrition-related chronic diseases and ameliorate infectious diseases.

Grand Forks Human Nutrition Research Center, P.O. Box 7166, University Station, Grand Forks, ND 58202; Dr. Forrest Nielsen, director, (701) 795-8456. Established in 1970, the center focuses on defining human requirements for trace elements and the physiological and biochemical factors which influence those requirements. Bioavailability from common diets and interaction with other components of the diet are major interests.

Western Human Nutrition Research Center, P.O. Box 29997, The Presidio of San Francisco, CA 94129; Dr. Janet King, director, (415) 556-9697. Established in 1980, the center conducts research to develop improved methods for monitoring and evaluating human nutritional status and to determine human nutritional requirements and factors that lead to malnutrition.

Human Nutrition Research Center on Aging, Tufts University, 711 Washington Street, Boston, MA 02111; Dr. Irwin Rosenberg, director, (617) 556-3330. The center was established in 1979. Research is conducted on the special nutritional needs of people as they age, with a view toward enhancing the quality of later life through improved nutrition and health.

Children's Nutrition Research Center, 1100 Bates Street, Houston, TX 77030; Dr. Dennis Bier, director, (713) 798-7000. The center was established in 1979 in connection with Baylor College of Medicine. Research is conducted on

**Table 1. USDA Research in Human Nutrition (from HNRIMS, December 14, 1993,
for Fiscal Year 1991)**

HNRIMS Nutrition Code Area	USDA Projects		
	Number	%research in area	%federal
Normal Human Requirements for Nutrients			
1. Maternal	57	4.6	24
2. Infant and Child	60	4.9	16
3. Adolescent	18	1.5	22
4. Adult	118	10.0	53
5. Elderly	74	6.0	32
10. Immunology, Nutrition & Infection	35	2.8	19
12. Genetics and Nutrition	49	4.0	22
13. Nutrition and Function	41	3.3	11
14. Nutrition Interactions	119	9.6	27
15. Other Conditions and Nutrition	59	4.8	11
Health Promotion & Prevention of Diet-Related Disorders			
6. Cardiovascular Disease & Nutrition	137	11.1	22
7. Cancer	59	4.8	9
8. Other Diseases (e.g., Osteoporosis, Diabetes, etc.)	31	2.5	5
9. Trauma and Nutrition	5	0.4	13
11. Obesity, Anorexia, and Appetite Control	85	6.9	19
17. Carbohydrates	136	11.0	42
18. Lipids	344	27.9	43
19. Alcohols	9	0.7	8
20. Proteins and Amino Acids	177	14.3	38
21. Vitamins	172	13.9	28
22. Minerals and Trace Elements	216	17.5	39
23. Water and Electrolytes	13	1.1	11
24. Fiber	86	7.0	68
25. Other Nutrients in Foods	111	9.0	71
Food Composition			
26. Food Composition	213	17.2	86
27. Bioavailability of Nutrients	133	10.8	78
28. Effects of Technology on Nutritional Characteristics	312	25.3	96
29. Other Food Science	194	15.7	95
Nutrition Monitoring			
16. Nutritional Status	114	9.2	38
30. Food Consumption Surveys	60	4.9	67
31. Dietary Practices, Food Consumption Patterns	188	15.2	45
Nutrition Information and Education			
32. Methods for Informing Public about Nutrition	25	2.0	28
33. Other Nutrition Education Research	26	2.1	53
Effects of Government Policy			
34. Govt. Policy and Socioeconomics	92	7.4	87
35. Parenteral, Enteral, and Elemental Nutrition	6	0.5	5

* Numbers are not additive since projects may be assigned to more than one nutrition code (1235 USDA research projects in system).

the unique nutrient needs of pregnant and lactating women and of children from conception through adolescence. Interactions of dietary components with the genetic heritage in growth and physiological and neurological development are current interests.

The Cooperative State Research Service (CSRS) is the agency in the U.S. Government that serves as an interface and coordinating mechanism between the USDA research organizations, the 59 designated States and territorial agricultural experiment stations, and the 1890 colleges and Tuskegee. Money is appropriated by Congress by authority of the Hatch and Evans-Allen Acts, as amended, and administered through CSRS to each State based on a formula. Before the States can spend the money, projects are peer-reviewed. The States have a large degree of freedom in allocating the money, other than submitting projects for approval and submitting annual progress reports. The farm bills also authorized special and competitive research grant programs. Research priorities are recommended by the State experiment station directors to USDA and are then incorporated into the Department's annual request for funds from Congress.

Nine regional research projects typify areas of nutrition research currently under way at State agricultural experiment stations in cooperation between ARS, Economic Research Service, and former Human Nutrition Information Service. These are (1) nutrient bioavailability; (2) health maintenance aspects of dietary recommendations designed to modify lipid metabolism; (3) behavioral and health factors that influence the food consumption of young adults; (4) nutritional assessment in older adults: diet intake and biochemical studies; (5) evaluation of effective intervention methods to improve the quality of well-being of rural elders; (6) dietary fat and fiber: knowledge, perceived risk, and dietary practices; (7) changing patterns of food demand and consumption behavior; (8) food safety through discovery and control of natural and induced toxicants and antitoxicants; and (9) private strategies, public policies, and food system performance.

The Nutrition, Food Quality, and Health Division of the National Research Initiative Competitive Grants Program is also administered by CSRS. Two program areas were supported in FY 1993. The primary objective of the Human Nutrient Requirements for Optimal Health Program is to support research that will fill the critical gaps in our knowledge of human nutrient requirements and the factors that influence them. The Food Safety Program continued to emphasize increasing our understanding of the mechanisms of pathogenesis, prevention, and control of food-borne, disease-causing bacteria. In FY 1993, special projects covering human nutrition were conducted at Cornell University on Integration of Nutrition Goals and Food Systems, at Iowa State University on Designing Foods To Improve Nutrition, and at Louisiana State University on

Dietary Fat, Food Intake, Energy Expenditure, and Body Composition.

CSRS also funds work in human nutrition via grant programs administered by the Office of Higher Education Programs. The USDA National Needs Graduate Fellowships Program awards fellowships to U.S. colleges and universities in six national needs areas; that is, areas having shortages of expertise, including human nutrition and food science. Three areas are funded each alternating year. The 1890 Institution Capacity Building Grants Program provides support to 1890 land-grant institutions and Tuskegee University for the purpose of advancing the teaching and research projects in targeted high-priority areas. The Higher Education Challenge Grants Program provides support to U.S. colleges and universities to enhance their educational programs in the food and agricultural sciences.

The former Human Nutrition Information Service conducted applied research in food and nutrition—what foods Americans buy and eat, what nutrients are in the foods we eat, and how we can make informed food choices. HNIS research includes the fields of food consumption, nutrition knowledge and attitudes, dietary survey methodology, food composition, and nutrition education.

The Food and Nutrition Service (FNS) is responsible for administering and performing policy research for domestic food assistance and nutrition education programs, including the Food Stamp Program, the Child Nutrition Programs (which include the National School Lunch Program, the School Breakfast Program, the Child and Adult Care Food Program, and the Summer Food Service Program), and the Special Supplemental Food Program for Women, Infants, and Children (WIC). Research and evaluation in support of these programs is managed by the FNS Office of Analysis and Evaluation with assistance from the divisions that administer the programs and the FNS Nutrition and Technical Services Division. Studies include assessments of the effectiveness of nutrition intervention, growth management and implementation of technological developments, and participant characteristics, and evaluation of service delivery options. Most studies are conducted through competitively awarded contracted research, with some use of cooperative agreements, targeted grants, and in-house analyses.

The Economic Research Service (ERS) conducts a wide variety of research and analysis on food and agricultural issues, some of which relate to human nutrition. Research is conducted on food consumption patterns and their determinants, changes in dietary practices, and the effects of government policies and socioeconomic factors on food consumption. These studies use data from existing surveys, such as the Bureau of Labor Statistics' Continuing Consumer Expenditure Survey, USDA's system of nationwide food consumption surveys, and the Department of Health

and Human Services' (DHHS) Health and Nutrition Examination Survey.

An ongoing research activity for ERS is analysis of the effects of alternative government policies, especially food policies, on producers and consumers. This research provides insight as to the effects of existing and alternative food and agricultural policies on food consumption, dietary levels, expenditures, and the nutritional status of target populations.

B. Normal Requirements for Nutrients

1. Human Nutrient Requirements for Optimal Health Program Within the National Research Initiative Competitive Grants Program

In FY 1993, the Human Nutrient Requirements for Optimal Health Program emphasized (1) bioavailability of nutrients; (2) the interrelationship of nutrients; (3) nutrient requirements of healthy individuals across all age groups; (4) mechanisms underlying the relationship between diet and health maintenance, such as the effects of nutrients on the immune system; (5) the cellular and molecular mechanisms underlying nutrient requirements, including the modulation of gene expression by nutrients; and (6) food consumer behavior, including identifying and developing methods to overcome obstacles to adopting healthful food habits, to convey knowledge to target audiences, and to ascertain factors that affect food choices. In FY 1993, the program made 27 awards, for a total of \$3.6 million. Listed below are the projects that were supported:

- dietary essential fatty acids and cellular expression of prostaglandin H synthase, \$190,000/3 years
- essential fatty acids in pregnancy and lactation, \$180,000/3 years
- lipid responsiveness to dietary lipid in black and white women, \$150,000/3 years
- effect of saturated fatty acids on LDL synthesis and degradation in women, \$160,000/2 years
- effects of maternal fish oil and vitamin E intake on oxidation susceptibility of weaned pups, \$55,210/2 years
- vitamin E requirement of elderly consuming fish-derived (n-3) fatty acids, \$100,000/2 years
- carotenoid absorption and metabolism, \$160,000/2 years
- application of the deuterated retinol dilution technique to assess vitamin A requirements in free-living populations, \$150,000/2 years
- retinol-modulated disulfide alterations in membrane trafficking, \$100,000/2 years
- metabolism and function of retinoic acid in quail embryogenesis, \$100,000/2 years
- vitamin E effects on endothelial function in brain blood vessels in vivo, \$123,781/2 years
- dietary folate requirement of lactating women, \$180,000/3 years
- vitamin B₆ requirements of women and the effect on carnitine metabolism, \$160,000/2 years
- carnitine depletion in vitamin C deficiency and food restriction, \$100,000/2 years
- nutritional copper status and the nervous system, \$200,000/3 years
- dietary copper restriction and cardiomyopathy: mechanism and requirement studies, \$200,000/3 years
- regulation of zinc homeostasis in humans, \$200,000/2 years
- iron homeostasis and the regulation of the IRE-BP in HL 60 cells, \$70,000/2 years
- the effect of calcium supplementation of young adult white women on bone mass, \$168,000/3 years
- role of zinc in the nervous system, \$150,000/2 years
- infant calcium dynamics using oral 44Ca and IV 46Ca, \$160,000/2 years
- intracellular copper-trafficking proteins, \$90,138/2 years
- cellular zinc requirement for gene expression by steroid receptor superfamily, \$70,282/2 years
- factors related to urinary oxalate excretion in man, \$150,000/3 years
- macronutrients and regulation of neuropeptide gene expression, \$160,000/2 years
- conference on mathematical modeling in nutrition; vitamins, proteins, methods, \$7,000/1 year
- the effect of parental smoking on the quality of low-income children's diets, \$41,081/1 year

2. Infants and Children

- A Simple Strategy Improves Weight Gain in Nursing Low-Birth-Weight Infants

Low-birth-weight infants fed their mothers' milk often gain weight at a lower rate after birth than the rate of gain in utero. This low rate may result from a limited intake of nutrients, despite fortification of the milk with added protein, minerals, and carbohydrates. The lipid content of hindmilk is known to be 2 to 3 times greater than that of foremilk. To enable weight gain equivalent to in utero gains, human milk was fortified with its hindmilk fraction to increase the endogenous lipid content. When infants were fed their mothers' milk fortified with the hindmilk fraction, their weight increased significantly; the increment in fat concentration of the hindmilk was directly related to the increase in the rate of weight gain in all infants. This simple lactoengineering technique has great potential for supporting weight gain in low-birth-weight infants.

- Girls Need More Calcium at Young Age

Puberty is recognized as a period of maximal growth and bone formation; as much as 97 percent of total body calcium may be accumulated in girls before they are 16 years of age. At the Children's Nutrition Research Center, the rate of calcium deposition in bone and the size of the exchangeable calcium pool in bone were measured in 50 girls ages 5-16 years, using intravenously administered isotopic calcium. The lowest bone calcium deposition rates were found in the girls who were more than 24 months postmenarche. Current recommendations for calcium intake in children, however, do not suggest an increased intake until 11 years of age, which is well after the onset of puberty in many girls. Furthermore, it is unlikely that increasing calcium intake post-puberty would significantly increase bone calcium deposition rates, and hence, density. The results suggest that dietary patterns which will promote mineralization in girls should be encouraged throughout the early to midpubertal period. The current recommended daily allowance for calcium in children may be inadequate and put these children at risk for osteoporosis as adults.

- Extra Calcium and Phosphorus Improve Bone Mineral Content in Very Low-Birth-Weight Infants

When very low-birth-weight infants who are tube-fed do not retain sufficient calcium and phosphorus, they may develop bone diseases. The calcium and phosphorus content needed to ensure appropriate bone mineralization has not been established. Infants at the Children's Nutrition Research Center received formula that contained either standard quantities of calcium (1.25 millimole) and phosphorus (1.5 millimole) or greater than standard quantities of calcium (1.7 millimole) and phosphorus (2.0 millimole). Calcium and phosphorus intake, urinary excretion, and apparent

retention were measured every 3 days during supplementation. Apparent retention of calcium and phosphorus was significantly greater in the group that received greater quantities. Bone mineral content and its rate of increase were significantly greater in the group that received the increased amounts of the minerals. So the likelihood of bone disease is reduced when infant formulas contain more than the standard quantities of calcium and phosphorus.

- The Role of Growth Hormone and the Insulin-Like Growth Factors in Neonatal Malnutrition

Work in Illinois involves investigation of the underlying hormonal and nutritional mechanisms responsible for growth retardation during malnutrition by characterizing the molecular regulation of growth hormone (GH) receptor and insulin-like growth factors (IGF-I and IGF-II) in a rat model of neonatal protein-calorie malnutrition. Pups were malnourished from birth via maternal food restriction (60 percent ad lib intake). Nutritional repletion between 16 and 20 days of age restored pup body weight from 60 percent to 80 percent of control body weight. Treatment with IGF-I and GH during refeeding resulted in a further 4 percent and 10 percent increase in body weight compared to untreated control pups. Although IGF-I did not stimulate overall body weight gain, it caused a threefold and twofold increase in spleen and kidney weights, respectively. IGF-I was also selective for spleen and kidney growth causing 1.5-fold and 1.2-fold increases in weight, respectively. GH, which was the most effective in stimulating total body weight gain, also preferentially stimulated growth of skeletal muscle. In conclusion, hormonal therapy during recovery from neonatal malnutrition enhances body weight gain and the growth of specific organs. GH appears to be most effective in stimulating growth and accretion of lean body mass.

3. Maternal Nutrition

- Bioelectrical Impedance Spectroscopy (BIS) for Monitoring Fluid Volume Changes During Pregnancy

Changes in body composition reflect changes in nutritional status and, oftentimes, health status. Body composition measurements may be affected by changes in the body's total water volume, specifically the extracellular fluid volume, and give erroneous results. In healthy individuals these two fluid compartments are tightly controlled; however, in cases of nutritional compromise or ill health, extracellular fluid will disproportionately increase the total body water volume. It is important, therefore, to monitor changes in the extracellular fluid volume and the total body water.

Researchers at the Western Human Nutrition Research Center, University of California, Berkeley, and the Children's Nutrition Research Center used the BIS technique to noninvasively measure changes in these fluid

volumes of women before, during, and after pregnancy. Results from the BIS technique were compared to laboratory isotope tracer methods and found to give equivalent results. Mean differences between the BIS and isotope tracer techniques, from pre-pregnancy through the postpartum measurements were only 1.3 L for extracellular fluid and 1.2 L for total body water. This noninvasive BIS technique shows great promise as a new technique for the quick, accurate, and noninvasive assessment of body fluid changes and thus, nutritional and health status.

Lipids in Breast Milk and Their Absorption

Since the 1930's researchers have known that fatty acid composition and structure affect lipid absorption. This is one possible explanation for the better absorption of lipid from breast milk. Lipid from human milk contains 20-25 percent palmitic acid, which, when free, is not absorbed well. The structure of breast milk triglyceride is somewhat unique in that palmitic acid is located predominantly in the sn-2 position and may be absorbed more efficiently as a monoglyceride. A second possible explanation for superior lipid absorption from breast milk is the presence of a nonspecific endogenous lipase. If this lipase contributes significantly to lipid digestion, the palmitic acid would be cleaved from the sn-2 position.

Researchers in Connecticut infused breast milk containing 25 percent palmitic acid at two rates into the duodenum of rats and collected lymph to determine if the positional integrity of palmitic acid was maintained through digestion and absorption. After fast infusion (105 mg lipid/hr) the sn-2 position of the lymphatic triglyceride contained 30 percent palmitic acid and after slow infusion (35 mg lipid/hr) 36 percent palmitic acid. The predominance of palmitic acid in the sn-2 position of the lymph triglyceride was maintained at both infusion rates. Under the conditions of our study, the endogenous breast milk lipase did not appear to contribute significantly to lipid digestion.

4. Adult Nutrition

Moderate Alcohol Consumption Linked to Hormone Changes in Women

Changes in the exposure of breast tissue to estrogen and other hormones may be one of the key processes by which diet affects the risk of developing breast cancer. Several dietary factors have been shown to affect blood estrogen levels. The potential role of alcohol consumption has been a prominent consideration in the etiology of breast cancer and is particularly important because it is a risk factor that can be modified. Studies by the Lipid Nutrition Laboratory, Beltsville Human Nutrition Research Center have shown that moderate alcohol consumption increased estrogen and other hormone levels in premenopausal women consuming a controlled diet. Increases in hormones occurred in various phases of the menstrual cycle but were especially prominent

around the time of ovulation. Thus, increased risk of breast cancer due to moderate alcohol consumption may be related to increased exposure of breast tissue to estrogen.

• Training Uses Energy but Doesn't Change Sleeping Energy Expenditure

Exercise is recognized as an activity that benefits health by improving strength and endurance and helping to control weight. In a study at the Beltsville Human Nutrition Research Center, the number of calories burned by sedentary, endurance-trained, and strength-trained men was determined in controlled and unrestricted environments. Five sedentary, five endurance-trained, and five strength-trained men participated. Energy expenditure was measured in a metabolic chamber and in unrestricted conditions by using double-labeled water. The strength- and endurance-trained men required more calories to go about their normal lifestyle, which included exercise training, than did the sedentary men. However, the number of calories burned within the metabolic chamber were the same for all three groups, indicating that while exercise causes an increase in energy expenditure, it does not cause an increase in the long-term metabolic rate. The added calories were associated only with the energy required to do the exercise. The increase was similar for endurance and strength training, indicating that both activities help balance energy expenditure and intake.

• Eating Patterns and Food Choices Affect Energy Intake of Obese Women Who Lost Weight

Obesity is prevalent in the United States. Overweight individuals who successfully lose weight are likely to regain this weight within 5 years. Regular exercise improves the chances of maintaining a reduced body weight, but adherence to a healthful diet is also essential. Scientists at the Western Human Nutrition Research Center studied dietary intake of women who had successfully lost weight and were performing prescribed exercise to maintain the reduction. Some women continued to restrict their intake of food energy and others consumed excessive food energy. Food energy intake was not related to the amount of energy used during prescribed exercise but was related to the amount of energy used during rest. Equally important was the association between food energy intake and the score for the eating inventory, the score from a psychological questionnaire that measured eating behavior.

The diets of the women who overate contained more dietary fat, and also these overeaters consumed more of their food energy in the evening after dinner compared to the undereaters. Evaluating the eating behavior of formerly overweight individuals using the eating inventory will identify those individuals who are more likely to overeat. The weight management strategy of these individuals should include counseling to reduce dietary fat and evening snacks.

- Calorie Restriction Decreases Number of Circulating Natural Killer (NK) Cells and Serum Levels of Immunoglobulin in Overweight Women

One commonly used method for weight reduction is a drastic decrease in calorie intake. The influence of such dietary restrictions and the diet compositions on immune response and the incidence of infection in such individuals is currently unknown. Ten women were studied at the Western Human Nutrition Research Center to determine effects of calorie restriction and level of fat (40 percent vs. 18 percent) in the diet during restriction on measures of immune status. All 10 subjects were fed the high-fat (40 percent) diet to maintain body weight for 42 days. For the next 84 days, calorie intake for all subjects was reduced by half, with 5 women remaining on the high-fat diet and the other 5 fed the low-fat (18 percent) diet.

Neither weight loss nor immune status was affected by the level of fat in the diet during restriction. Calorie restriction caused loss of 15-20 pounds and significantly reduced the blood concentrations of some of the antibody proteins and the number of circulating NK cells, which kill tumor and virus-infected cells. These decreases in the measures of immune response did not cause an increase in sickness and infections in the study subjects, but more drastic calorie restrictions or moderate restrictions in high-risk individuals should be done under clinical supervision.

- Hepatic Regulation of Cysteine Utilization for Taurine Synthesis

Regulation of amino acid metabolism is complex given the requirements of amino acids for synthesis of proteins, as well as numerous other essential compounds and the ability of the body to use the carbon chains for gluconeogenesis or to oxidize them for energy. Cysteine, a sulfur-containing amino acid, is used for synthesis of proteins, glutathione, coenzyme A, taurine, and inorganic sulfur, and the catabolism of cysteine requires that the body excrete sulfur and nitrogen as waste products. Using freshly isolated hepatocytes from rats, researchers at Cornell University investigated the effects of dietary protein and sulfur amino acids status on the metabolism of [³⁵S]-labeled cysteine.

Compared with control rats, hepatic cysteine dioxygenase activity (which is responsible for the oxidation of cysteine) increased in rats fed diets high in protein or supplemented with sulfur amino acids. In contrast, hepatic cysteinesulfinate decarboxylase activity (which is responsible for the conversion of cysteine to taurine) decreased in rats fed the higher levels of protein but not in rats fed supplemental sulfur amino acids. These changes in cysteine dioxygenase activity were verified by increased catabolism of cysteine in hepatocytes. Taurine production was markedly increased in hepatocytes from rats fed supplemental sulfur amino acids but not in cells from rats fed excess

protein. The catabolism of protein to taurine appeared to be regulated in a reciprocal manner by dioxygenase and decarboxylase in rats fed excess protein such that the actual rate of taurine production did not change markedly. The hepatocyte may be able to divert excess cysteine to taurine under conditions where there is an excess of sulfur amino acids; whereas, under conditions where excess protein is being catabolized and used for energy, cysteine is also catabolized.

5. The Elderly

- Antioxidant Nutrients from Diet Are Protective for Age-Related Eye Degeneration

Age-related macular degeneration is one of the leading causes of visual loss in people over 65 years of age. Antioxidant vitamins A, C, and E may protect against age-related degeneration of the eye. At the Human Nutrition Research Center on Aging, plasma levels of retinol, B-carotene, ascorbic acid, and a-tocopherol, which are specific forms of these vitamins, were measured in 976 men and women of the Baltimore longitudinal study of aging and analyzed for correlation with eye photographs taken of these people. After adjusting for age, sex, and cataracts, those participants with high plasma levels of vitamin E (a-tocopherol) were less likely to have degeneration of the macula (part of the eye) than those with low levels in the blood. Those with high levels of all three vitamins also seemed to be protected. These results suggest that antioxidant vitamins may protect against some of the age-related changes in the eye. However, general supplement use did not appear to be associated with protection.

- Resistance Training Improves Physical Function in the Elderly

Muscle weakness in the elderly has been consistently related to impaired mobility and the risk of falls. Potentially reversible components of the muscle weakness of aging include underuse and undernutrition, both of which are prevalent in nursing home populations. A nursing-home-based intervention study to improve muscle strength through progressive resistance training of the lower extremities and/or multinutrient supplementation in residents aged 70-100 was conducted by scientists of the Human Nutrition Research Center on Aging. Measurements of falls, medical status, psychological variables, functional status, nutritional intake and status, body composition, muscle mass and structure, muscle function, gait, and balance were taken at the beginning of the study.

The nursing home residents were assigned to (1) high-intensity progressive resistance training of the hip and knee muscles 3 days per week; (2) daily nutrient supplementation with a 360-kcal high carbohydrate, low- fat liquid supplement; (3) a combination of groups 1 and 2; and (4) a control

group for 10 weeks. Both nonsupplemented groups received a liquid placebo every day, and both nonexercising groups attended three sessions of leisure activity every week in order to control for the attentional aspects of the exercise and nutritional interventions. At the end of the period, the supplement showed no effect on muscle function, body composition, mobility, or functional status. The exercisers had significant improvements in muscle strength, gait speed, and stair climbing compared to nonexercisers. Thus, muscle atrophy and weakness in frail elderly people remain very responsive to appropriate exercise intervention, which improves functional mobility.

- Mild Vitamin K Deficiency in Humans

Vitamin K is required for forming blood-clotting factors that bind calcium and are required for the blood to clot normally. Recently, vitamin-K-dependent factors were also identified in bones and other tissues. Scientists at the Human Nutrition Research Center on Aging developed a diet low in vitamin K to determine whether or not a mild vitamin K deficiency could be induced in normal people. The diet contained a selection of food that is usually low in its vitamin K content (chicken, lean ground beef, potatoes, noodles, milk, peeled fruit, and fruit juices) and contained no green and leafy vegetables. Groups of 8 males and females aged 20-40 and 60-80 years resided and consumed their meals in the Metabolic Research Unit of the center and ate a diet containing less than 1/8 of the recommended daily allowance for vitamin K (80 mg) for 2 weeks. During that time, blood levels of vitamin K dropped below normal values and urine levels of the vitamin K-dependent factor (gamma-carboxyglutamic acid) decreased. None of the volunteers were observed to have any changes in their blood coagulation. The elderly people appeared to be more resistant to developing mild vitamin K deficiency than the younger ones. The results of this study demonstrate that a mild deficiency of vitamin K can be produced in a few days by consuming a diet low in vitamin K and that this deficiency is not accompanied by changes in blood clotting.

- Cranberry Juice Increases Protein-Bound Vitamin B₁₂ Absorption in Elderly Hypochlorhydric Subjects

Food-bound vitamin B₁₂ absorption is diminished in elderly people who are not able to secrete hydrochloric acid and have chronic inflammation of the stomach—a condition known as “atrophic gastritis.” However, when hydrochloric acid is drunk along with the food-bound vitamin B₁₂, the absorption of the vitamin returns to normal. A study was done at the Human Nutrition Research Center on Aging to test whether food-bound vitamin B₁₂ absorption would be enhanced with a natural acidic drink—cranberry juice. Protein-bound vitamin B₁₂ absorption improved in subjects with low acid outputs by their stomachs with either cranberry juice or hydrochloric acid. Thus, the ingestion of the natural acidic drink resulted in an increased food-bound

vitamin B₁₂ absorption in subjects with low stomach acid output.

- Folate, Vitamin B₁₂, and Vitamin B₆ Status are Associated with Plasma Homocysteine in Older Americans

Recent studies demonstrated associations between some cardiovascular and neuropsychiatric diseases and elevated levels of homocysteine, a nonprotein that forms amino acid. While some cases of hyperhomocysteinemia may have a genetic basis, some data indicated this condition may be attributed primarily to nutritional status. Scientists at the Human Nutrition Research Center on Aging examined survivors aged 67-96 years from the original Framingham Heart Study population. They found that one-quarter of the people had higher than normal homocysteine levels and two-thirds of those could be attributed to low or marginal status of folate, vitamin B₁₂, and/or vitamin B₆. A strong case can now be made for the prevention of the marginal deficiencies of these vitamins, common among older people, as they may be linked to the risk of cardiovascular disease, the leading cause of death in this population.

- Regulatory Proteins Are Altered by Riboflavin Status and Calorie Restriction

Changes in diet can alter the way in which people utilize energy and, consequently, influence growth. However, processes such as growth actually represent a wide range of biochemical processes that must all be turned on or off systematically. Researchers in Minnesota believe that coordination is accomplished by nuclear regulatory proteins. That is, some dietary event signals a change in specific nuclear regulatory proteins that then alter the way in which specific regions of nuclear DNA are transcribed to messenger RNA's and that, in turn, results in changes in enzymes.

Nuclear enhancer binding proteins (NEBP) have been proposed to be very important in regulation of energy metabolism. The researchers fed rats a diet deficient or adequate in riboflavin profoundly altering energy metabolism and growth. Because riboflavin-deficient rats voluntarily decrease their food intake, a calorie restricted group was included. NEBP increased two-fold due to calorie restriction and three-fold with riboflavin deficiency. These changes in the NEBP were shown to be the result of changes in the level of their specific messenger RNA's. Further, the change in messenger RNA's could be explained by changes in how fast the specific RNA's were transcribed from the DNA templates. Researchers concluded that the level of these nuclear regulatory proteins respond to changes in dietary status and that these changes are regulated at the level of transcription.

6. Nutrient Functions

- Differences in Calcium Metabolism May Reveal Why African-Americans Have Higher Bone Mass than Whites

Studies reveal that African-Americans and Mexican-Americans have greater bone mass and less osteoporosis than European-Americans. Investigators at the USDA Human Nutrition Research Center on Aging examined healthy women and compared their fractional calcium retention and production of the calcium-regulating hormones, 1,25-dihydroxyvitamin D and parathyroid hormone, during periods of high and low calcium intakes. African-Americans had higher levels of vitamin D than did European-Americans on both diets and a greater increase after calcium restriction. These findings raise the possibility that African-Americans have a lower excretion of vitamin D, which may account for their higher levels of the vitamin and more favorable bone status. This information could prove important to establishing the dietary requirements for calcium and vitamin D in older adults.

- "Conditionally Essential" Amino Acids in Humans

Traditional classification of amino acids as "essential" and "nonessential" should be reconsidered. Tyrosine, cysteine, glycine, proline, and arginine might be reclassified as "conditionally essential." All five require preformed amino acid skeletons. Using gas chromatography-mass spectrometry, scientists at the Children's Nutrition Research Center examined, in fed and fasted humans, the kinetics of plasma lysine, glutamate/glutamine, arginine, and proline following the oral administration of a mixture of uniformly (^U-13C-labeled protein and carbohydrate. Measurement of the appearance of products in plasma allows the sensitive detection of amino acid biosynthesis. The labeling pattern of arginine and proline suggested synthesis from both intestinal and systemic glutamate. However, while arginine synthesis was readily measurable in fed and fasted states, significant proline synthesis occurred only in fasted subjects. Proline and arginine omnivores are "conditionally essential" and may be nutritionally indispensable for traumatized, burned, or postsurgical patients. Excess arginine is vital in removal of excess ammonium ions. Arginine is the indispensable precursor of creatinine in the kidney. Availability of arginine may affect blood pressure regulation and higher cognitive function.

- Low Dietary Carotene Increases Oxidative Damage

Eating foods high in carotenes (such as carrots, squash, and tomatoes) is associated with reduced risk of getting certain cancers. Scientists speculate that carotenes might protect us from cancers by preventing oxidative damage, but the only established role of carotenes in humans is to serve as sources of vitamin A. Scientists at the Western Human

Nutrition Research Center completed a study in which a diet low in carotenes (but with adequate vitamin A) was fed to healthy adult women for 10 weeks, followed by the same diet with added carotenes for 4 weeks. Oxidative damage increased while the women were fed the low carotene diet, then decreased after they were given carotenes. These results suggest which carotenes may form an important part of the antioxidant defense system which protects against oxidative damage, a known risk factor for cancer.

- Dietary Folic Acid Intake Needed To Reduce the Risk of Heart Disease

Individuals with abnormally high levels of blood homocysteine, a naturally occurring amino acid, are at increased risk for developing heart disease. High levels of homocysteine can occur due to a deficient dietary intake of folic acid, a B vitamin found in green vegetables and some fruits. Scientists at the Western Human Nutrition Research Center and at the UCLA School of Public Health, conducted a controlled study in which dietary folate equivalent to 12 percent, 100 percent, and 220 percent of the current Recommended Dietary Allowance (RDA) were fed to 10 healthy men to determine the folate intake that would prevent elevated homocysteine. Nearly half of the men developed high homocysteine levels after 4 weeks on the low folate intake. Some high levels persisted even after 2 weeks on the 100 percent RDA intake, but all decreased to normal within 9 days when the high intake was fed. The results indicate the current RDA for folic acid may not be sufficient to prevent elevated homocysteine levels that increase the risk of thrombotic-type heart disease.

- Beta-Carotene Protects Women from Oxidative Damage

Carotenes are colored pigments found in fruits and vegetables. People who eat large amounts of carotene-containing foods (such as carrots, tomatoes, and squash) have lower rates of cancer and heart disease than people who do not. Carotenes may protect against cancer and heart disease by reducing oxygen-related damage to body cells and tissues. To find out if carotene depletion would increase indicators of oxygen damage in people, scientists at the Western Human Nutrition Research Center fed 9 healthy women a normal diet that was low in carotenes for 10 weeks, then the same diet with large amounts of carotenes added for 4 weeks. Several measures showed more oxygen damage and weaker antioxidant defense when the women ate the low-carotene diet and less oxygen damage and stronger antioxidant defense when they ate the high-carotene diet. If this experiment is substantiated, it will show that carotenes can protect people from oxygen damage which may contribute to some diseases. That finding would suggest that carotenes are essential nutrients in their own right.

- Kind of Starch Determines Metabolism in Humans

The U.S. population is advised to consume more food in the form of complex carbohydrate (starch and fiber), rather than sugar, as a means to reduce the risks of diabetes and heart disease. The recommended form of carbohydrate that should be consumed is one of the questions investigated by nutritionists at the Beltsville Human Nutrition Research Center. Cornstarch from one variety of corn (Amylomaize 7) containing mainly amylose, a straight-chain starch, was compared to standard cornstarch containing mainly amylopectin, a branched-chain starch.

Products made with both starches were added to the diets of 24 volunteers for a total of 28 weeks, with 14 weeks on each type of starch. Plasma insulin and triglyceride levels were significantly lower after the amylose starch compared with standard starch. Subjects who had the highest initial levels had the greatest decrease when amylose starch was consumed. Plasma glucose and insulin response to a glucose tolerance test are commonly used to evaluate people with abnormal carbohydrate metabolism, such as diabetes. Elevated plasma cholesterol and triglycerides are considered risk factors for coronary heart disease. Chronic consumption of diets enriched with amylose starch normalized insulin response and reduced triglyceride levels, showing potential benefit for people at risk for diabetes or heart disease.

- New Approaches To Measurement of Lipid Metabolism

Abnormal concentrations of serum lipids are ultimately caused by alterations in their intake, synthesis, or removal, but the relative contribution from each process has remained uncertain because of technical and theoretical constraints on the capacity to measure dynamic processes in living organisms. A new measurement technology was recently developed in California that allows intracellular biosynthetic and other metabolic events to be quantified noninvasively *in vivo*. This method, called mass isotopomer distribution analysis (MIDA), utilizes mass spectrometers in a new way, based on principles of probability analysis. The synthesis rates of circulating fats, cholesterol, and lipid-carrying proteins can now be measured routinely in humans, without radioactivity.

The impact on our understanding of how nutrients alter metabolism of lipids in the body has already been substantial. Answers to long-standing questions are emerging, such as the efficiency of conversion of dietary carbohydrate to triglycerides in humans, the fate of carbohydrate when eaten in excess or as part of low-fat diets, the contributions from dietary cholesterol and endogenous cholesterol synthesis to serum cholesterol, the influence of time of day or menstrual cycle on cholesterol and fat synthesis, and the reasons why some people have higher risk "patterns" of serum lipids even at the same concentrations in blood.

C. Role of Nutrition in Promoting Health and Preventing Diet-Related Disorders

1. Body Composition

- Genetic Diversity in Patterns of Fat Deposition in Humans

The amount and distribution of body fat, especially abdominal visceral fat, is a significant factor in maintaining health. Of major concern is the effect of weight reduction programs on the site of fat loss and the resulting effect on body composition. Scientists at the Beltsville Human Nutrition Research Center found significant differences in the amount of visceral adipose tissue in black and white women but no differences between binge and nonbinge eaters. Use of computerized tomography to quantitate the total amount of fat, as well as the distribution of fat in the body, allowed the scientists to follow changes in fat distribution during a 6-month weight reduction study. The results may explain the differences in morbidity and mortality between black and white women and are of particular benefit to African-American women.

- A Simple Field Technique To Estimate Body Muscle, Bone, and Fat

The use of standard laboratory methods for the assessment of human muscle, bone, and fat in national health and nutrition surveys and multicenter studies requires a standardized technique for nontechnical personnel to employ. A candidate is bioelectrical impedance analysis, which is safe, inexpensive, and easy to use. The method, used to develop an equation to predict muscle, water, and bone at the Grand Forks Human Nutrition Research Center, was compared with dual x-ray absorptiometry (a laboratory-based method). A group of adults with diabetes was studied, and a mathematical model was developed similar to one previously derived in a sample of healthy adults. This model validation indicates the general application of impedance technology for use in research outside the laboratory. Its use will facilitate evaluation of changes in body composition of diabetic adults undergoing insulin therapy without the need for expensive laboratory equipment.

- Health Maintenance Aspects of Dietary Recommendations Designed To Modify Lipid Metabolism

Parallel experiments conducted at the Iowa and Nebraska stations compared the impact of a diet patterned after the Dietary Guidelines for Americans with that of a diet reflecting the nutrient intake recorded by the 1974 Health and Nutrition Examination Survey (HANES) on the cholesterol status and other indicators of wellness in young women. Baseline intakes of the risk-elevating dietary constituents—fat, saturated fats, and cholesterol—were 117 percent, 106 percent, and 122 percent, respectively of the

intakes recommended by the Dietary Guidelines; intakes of the risk-reducing constituents—polyunsaturated fats, carbohydrate, and fiber—were 67 percent, 90 percent, and 40 percent, respectively of the recommended values.

The women were then sequentially fed a diet modified to meet the Dietary Guidelines for Americans and a diet patterned after the nutrient intake recorded by the 1974 HANES. Relative to the baseline and 1974 HANES phases, serum cholesterol and low-density lipoprotein (LDL) cholesterol levels were significantly lower during the guidelines phase of the study. The 1974 HANES diet increased high-density lipoprotein (HDL) cholesterol. The scientists representing the 10 stations participating in this regional study evaluated the impact of the guidelines diet on a total of 179 wellness-related variables. This comprehensive approach revealed significant dietary effects on 47 variables; changes in other variables reflected the impact of interactions between the constituents of the guidelines diet.

In addition to its impact on cholesterol status, the guidelines diet effected changes in the fatty acid profiles of serum-free fatty acids, serum triglycerides, and erythrocyte phospholipids. Indices of iron, potassium, calcium, and magnesium status deteriorated during the guidelines phase of the trial, the phase that emphasized a decrease in the consumption of animal products and an increase in fiber-rich foods. The deteriorating iron status, a consequence of a 37- percent decrease in iron absorption, reflected the consequences of a decrease in the proportion of iron intake in the form of heme iron and an increase in dietary fiber. The less positive calcium balance probably reflected the increased fiber intake. The major objective of the promulgators of the Dietary Guidelines for Americans is to lower serum cholesterol, an important risk factor for young men. This diet caused a deterioration in the iron and calcium statuses of young women, the major problem areas for this population.

The emphasis of this regional project was on diet-mediated impacts on lipid metabolism. This expertise permitted the investigators to identify diet-mediated aberrations in eicosanoid metabolism. The guidelines diet, with a 29 percent higher polyunsaturated fatty acid content, elicited a significant decrease in prostaglandins I and E synthesis by endothelial cells and a significant increase in thromboxane A synthesis by platelets. The significance of these changes lies in the concomitant increase in the prothrombogenic thromboxane A/prostaglandin I ratio, a change associated with higher risks of myocardial infarct and stroke. This study confirms a significant guidelines-mediated impact on serum cholesterol and LDL cholesterol levels. The study uncovers guidelines-mediated aberrations in eicosanoid metabolism, a concern for men and women, and deteriorations in iron and calcium statuses, major concerns for this population of young women.

2. Dietary Lipids

- Oils Rich in Polyunsaturated or Monounsaturated Fatty Acids Can Be Substituted for Saturated Fatty Acids as Part of a Cholesterol-Lowering Diet

While recommendations for heart-healthy diets include a reduction in saturated fat and cholesterol intake, there is still debate whether the remaining fat in the diet should be relatively high in monounsaturated or polyunsaturated fatty acids. Researchers at the Human Nutrition Research Center on Aging examined this issue by testing 15 middle-aged and older adults with high LDL cholesterol concentrations under strictly controlled conditions. The subjects received low-fat diets in which two-thirds of the fat calories were given as canola, corn, or olive oil in a randomized, double-blind fashion for 32 days each. Plasma cholesterol and LDL-C levels declined in each group, but the change was greater with canola- and corn-oil diets. Although differential effects were seen after the consumption of these three oils in some plasma lipid measures, none of these oils had a significant advantage in terms of altering the overall lipoprotein profile. These data are consistent with current dietary recommendations for modestly hypercholesterolemic middle-aged and older people that reduce LDL-C by 15 percent compared with the average U.S. diet, and that oils rich in either polyunsaturated or monounsaturated fatty acids can be substituted for saturated fatty acids when there is sufficient linoleic acid.

- Trans Fatty Acids No Worse Than Saturated Fatty Acids in Effects on Blood Lipids

Processing vegetable oils involves partial hydrogenation, a chemical process that leads to the formation of trans fatty acids, which have been suggested to carry a cardiovascular disease risk. In a study at the Beltsville Human Nutrition Research Center, trans fatty acids caused plasma total and LDL-cholesterol (“bad cholesterol”) elevations similar to, but no greater than, those from a diet with equally high levels of saturated fatty acids. At levels of trans intake equal to the average intake in the U.S. diet, there were only minor effects on HDL-cholesterol (“good cholesterol”) compared to a highly desirable diet having high levels of naturally occurring unsaturated fatty acids. Thus, partially hydrogenated vegetable oils may continue to be consumed in moderation as part of a healthy, fat-controlled diet. Results of this study are important to consumers and to farmers and manufacturers in the oilseed industry who want to produce healthy foods.

- Copper and Selenium Protect Against Free- Radical Damage

Free radicals are toxic compounds produced naturally in the body from normal metabolism or during metabolism of certain drugs. Environmental sources of free radicals also

include cigarette smoke, pollution, and other chemicals. It was hypothesized that dietary copper and selenium act as biological antioxidants and protect against free-radical damage in the body. The antioxidant activity of copper results in part from the Cu,Zn-superoxide dismutase enzyme, while the antioxidant activity of selenium may be associated with glutathione peroxidase activity.

The hypothesis that copper and selenium are biological antioxidants was tested by giving free-radical-producing drugs to copper-deficient or selenium-deficient rats. Cephaloridine, an antibiotic drug that causes kidney and liver damage, and adriamycin, a chemotherapeutic drug that causes kidney and heart damage, were tested. During copper deficiency, adriamycin increased kidney damage (as evidenced by increased plasma urea, kidney weight, urinary enzymes, and renal lesions) and decreased kidney glutathione peroxidase activity by 78 percent. However, copper deficiency had no effect on cephaloridine-induced kidney damage. In contrast to the results in the kidney, neither selenium deficiency nor copper deficiency potentiated cephaloridine liver toxicity, as assessed by plasma sorbitol dehydrogenase activity. These results suggest that the antioxidant functions of copper and selenium depend on the organ being studied, as well as the type of free-radical-inducing drug.

3. Dietary Fiber and Carbohydrates

- Aging and Metabolic Adaptation to Diet and Relation to Obesity

Human obesity is most often found in middle-aged subjects, develops slowly over a period of time, is associated with excess deposition of adipose tissue in differing patterns among individuals, and is partially genetically controlled. Obese individuals are often hypertensive, hyperinsulinemic, hypercholesterolemic, and may be physically inactive or have sedentary lifestyles. Because of the insidious nature of the development of obesity and the imprecise nature of food intake methodology in humans, animal studies are often employed to answer questions relating to the development of obesity and the effects of dietary modifications that may affect this development.

Studies were conducted to evaluate the effects of diet and aging on energy expenditure (by indirect calorimetry) and body composition. Sprague Dawley rats, housed in respiration chambers, were fed two high-carbohydrate diets (67 percent of calories from either cornstarch or sucrose), a high-protein diet (41 percent of calories from casein), and three high-fat diets (40 percent of calories from either corn oil, olive oil, or animal fat). Rats used in the studies were 2-, 3-, 9-, 10-, 18- and 24-month-old male animals. Regardless of diet, daily metabolizable energy intake and retention were significantly lower for the older animals, and fasting heat production declined 12 percent between 2 and 24

months of age. Energy utilization efficiencies were higher for the 9-month-old animals fed the high-cornstarch or high-protein diets (88.3 and 89.6 percent, respectively) than with 2-month-old animals fed the same diets (83.6 and 84.6 percent, respectively). There were no other age-related effects of diet on energy utilization efficiency. Efficiency values were 92.5, 88.3, and 86.0 percent for 2-month-old rats and 94.1, 85.9, and 80.3 percent for 9-month-old rats fed corn oil, olive oil, and animal fat, respectively. Ten-month-old rats were leaner (81.3 percent lean) and 24-month-old rats were fatter (21.3 percent fat) than the other age groups. These preliminary findings suggest that aging increases the efficiency of energy utilization and that the more saturated animal fat reduced energy efficiency in comparison with corn oil or olive oil.

4. Vitamins and Minerals

- Copper Deficiency Impairs the Ability To Dissolve Blood Clots

Thrombosis, or the presence of a blood clot blocking a blood vessel or formed in a heart cavity, is a contributing factor to coronary heart disease. Blood clots in other critical organs also can cause death or other pathological consequences. Researchers at the Grand Forks Human Nutrition Research Center found that copper-deficient mice have an impaired ability to dissolve blood clots. This finding suggests that inadequate copper nutriture can contribute to the development of thrombotic lesions associated with coronary heart disease and is further evidence that consuming a diet adequate in copper is helpful for maintaining healthy hearts and blood vessels and in preventing clotting disorders.

- Identification of an Indicator of Copper Status

Inadequate copper status is suspected to contribute to the occurrence of ischemic heart disease in humans. Confirmation of this suspected relationship has been constrained by the lack of a method to discriminate between adequate and inadequate copper status. Scientists at the Grand Forks Human Nutrition Research Center discovered that the copper-dependent enzyme cytochrome C oxidase in platelets (a cell found in blood) is a sensitive indicator of copper status. The activity of this enzyme, which is involved in the body's use of oxygen, is significantly depressed in platelets with marginal copper deprivation of both experimental animals and humans. The use of this indicator of copper status should help establish whether an inadequate intake of dietary copper is a major contributor to the occurrence of ischemic heart disease and, thus, show that copper is an important practical nutritional concern for U.S. citizens.

- Seasonal Sunlight Affects Vitamin D Stores

Vitamin D is acquired through the diet and from solar-stimulated skin synthesis. In Boston, latitude 42° N., sunlight stimulates skin synthesis of vitamin D in March through September and stimulates the degradation of vitamin D year-round. Scientists at the Human Nutrition Research Center on Aging evaluated the contributions of diet and skin sources to the plasma vitamin D levels in 59 very elderly women. They found that for a given vitamin D intake, those with greater sun exposure had lower, rather than higher, vitamin D levels in the wintertime. This suggests that in the winter, sunlight may degrade vitamin D acquired through the diet as it circulates through skin capillaries. Further work is needed to confirm this potentially important effect of sunlight on vitamin D stores.

- A Stable Isotope Study of Dietary Molybdenum Requirement of Young Men

Molybdenum is considered an essential element for humans because it is required for the function of several important enzymes. An inborn error of metabolism, molybdenum cofactor deficiency, is characterized by a combined deficiency of three of these enzymes. While molybdenum deficiency due to inadequate dietary intake has not been observed in humans, insufficient data are available to provide a scientific basis for dietary recommendations. This is partly because molybdenum is present in the diet and body in small quantities and has been very difficult to measure. Because molybdenum is required, data on which to base a dietary requirement are inadequate.

Scientists at the Western Human Nutrition Research Center developed methods for stable isotope tracer administration and analysis of molybdenum in humans. Results in young men suggest molybdenum levels in the body are regulated exclusively via urinary excretion. The results also suggest that 22 mg of molybdenum may be close to, but below, the minimum dietary requirement. Studies with other groups of people and amounts of molybdenum can now be done to describe population requirements.

- Dietary Regulation of Sex Hormone Synthesis and Metabolism

More than 100,000 women are diagnosed with breast cancer in the United States each year. As estrogen is one of the most important risk factors for breast cancer, dietary factors may act as cancer-preventive agents by decreasing estrogen levels. In postmenopausal women, fat tissue is the most important site of estrogen synthesis. Thus, dietary regulation of estrogen synthesis in fat tissue may influence cancer development in postmenopausal women. Researchers at the University of Minnesota worked with human cell culture systems to show that certain naturally occurring compounds inhibit estrogen synthesis in fat cells. Flavonoids and

lignans found in fruits, vegetables, grains, and legumes were found to inhibit estrogen synthesis to the same degree as drugs used in cancer chemotherapy. This work may ultimately lead to dietary recommendations for cancer prevention.

- Role of Meat in Physiological Maintenance of Cardiovascular Health

Researchers in Missouri found that a cardiomyopathy can be induced in the young pig fed a casein-based diet of 50 percent glucose, fructose, or starch that provided all nutrient needs recommended by the National Research Council. Excess intakes of vitamin E, copper, zinc, iron, and selenium did not prevent this disorder, even though histological examination revealed lesions similar to those caused by oxidative stress. To determine the impact of red meat on this disorder, pigs were fed either (1) the standard cardiomyopathic (CMP) diet (3 percent lipid, 50 percent glucose), (2) CMP PLUS (7 percent lipid, 50 percent glucose), or (3) red meat provided by lyophilized round (7 percent lipid, 50 percent glucose). Gross pathology revealed the previously described cardiomyopathic lesions in pigs fed the CMP and CMP PLUS diets but not in those fed the meat diet. Pigs fed meat grew faster and had higher hepatic zinc and hemoglobin concentrations than pigs fed the other treatments. Activity of antioxidant enzymes was not affected by dietary treatment. While lesions of this disorder did not occur when meat was fed, the etiology is unknown.

D. Food Composition and Nutrient Bioavailability

1. Improved Methods

- Simplified Measurement of Total Dietary Fiber in Fruits and Vegetables

Dietary fiber is a component of many foods—especially fruits and vegetables—that may reduce the risk of cardiovascular disease and certain cancers. To learn more about the role of dietary fiber in the prevention of disease, data on the fiber content of foods must be easy to measure, as well as accurate and precise. Thus, scientists at the Beltsville Human Nutrition Research Center developed simplified procedures for measuring total dietary fiber in fruits and vegetables.

Measurement of dietary fiber in most foods requires several tedious and laborious steps to remove such components as starch and protein before fiber can be determined. However, many vegetables and most fruits contain little or no starch. Therefore, those steps designed to remove starch were eliminated from the fiber determination. The resulting method is shorter and cheaper and produces less hazardous chemicals. This methodology will be very useful to commercial analytical laboratories, as well as laboratories of

food companies as part of fulfilling the requirements of the Nutrition Labeling and Education Act and generating data on the dietary fiber content of fruits and vegetables for use by the diet and health community.

2. Food Composition

- Plant Sources in the U.S. Diet Provide 75-85 Percent of Needed Omega-3 Fatty Acids

Linoleic and linolenic acids are the predominate polyunsaturated fats in the U.S. diet. Results from animal studies indicate that a balance between these omega-6 and omega-3 essential fatty acids in dietary fats is critical to good health and of nutritional importance to the consumer. The problems were (1) how to decide if animal data accurately reflect the metabolism of these fatty acids in human subjects; (2) how to conclude if the ratio or the amount of these fats in the diet controls the balance; and (3) how to determine if a normal U.S. diet contains sufficient omega-3 fatty acids to meet estimated requirements.

To answer these questions, human subjects were placed on diets containing different amounts of polyunsaturated fats for 2 weeks, and then the metabolism of linolenic and linoleic acid was followed by feeding stable-isotope-labeled analogues of each fatty acid. The results indicate that animal data are only a partial substitute for human data; that the amounts of the omega-3 and omega-6 fatty acids in diet are more important than the ratios; and the amount of linolenic acid in the U.S. diet provides 75-85 percent of the omega-3 fatty acids estimated to be needed in adult diets. The rest of the needed omega-3 fatty acids are very-long-chain (22-20 carbon) fatty acids from meat and fish.

- Nuts Provide Dietary Fiber

Nuts can be a good source of dietary fiber; however, the total dietary fiber content of many nuts has not been determined. Beltsville Human Nutrition Research Center food chemists sampled three brands of eight nuts according to the sales volume provided by Nielsen Scantract Data. The fiber content was determined using two enzymatic-gravimetric methods. Average fiber values ranged from 3.6 percent for cashews to 14.9 percent for macadamia nuts, with almonds, peanuts, pecans, pistachios, sunflower seeds, and walnuts having values between 6.2 percent and 10.5 percent. Chemical analysis of selected total dietary fiber (TDF) residues indicated that nonstarch polysaccharides constitute less than 50 percent of the dietary fiber components of most nuts. In the future, other constituents of the dietary fiber complex will be determined.

- Vegetable Oils Provide Adequate Vitamin K

Vitamin K is required for blood to clot and the formation of two proteins present in bone. Although the functions of the

two bone proteins are not understood, their existence implies a role for vitamin K outside of blood clotting. The Recommended Dietary Allowance (RDA) for vitamin K is 1 mg/kg body weight (0.45 mg/lb), but the adequacy of the American diet to furnish the RDA for vitamin K has not been determined. Unfortunately, such analysis cannot yet be performed due to a lack of reliable data for the vitamin K composition of commonly consumed foods and beverages.

As a first step toward having enough data, the Human Nutrition Research Center on Aging determined the vitamin K1 content of 10 commercially available vegetable oils. Canola and soybean oils contained the greatest amounts of vitamin K1 (140-200 mg/100 g) followed by olive oil (55 mg/100 g). Almond, sunflower, safflower, walnut, and sesame oils contained between 6-15 mg/100 g. Peanut and corn oils provided less than 3 mg/100 g. Vitamin K1 was stable to processing, decreased slightly with heat, and was rapidly destroyed by daylight and fluorescent light. Amber glass containers protected the oils from the destructive effects of light. Soybean and canola oils can provide more than 100 percent of the RDA for vitamin K when present in the diet at greater than 15 percent of the calorie content.

- Stable Isotopes To Measure Calcium and Vitamin D Interactions in Humans

Vitamin D deficiency results from gastrointestinal diseases in which calcium absorption is poor and from diets low in absorbable calcium. Researchers in Connecticut hypothesized that the vitamin D deficiency resulting from inadequate calcium absorption is caused by a faster breakdown of vitamin D metabolites. To study this in humans, a protocol was developed using a new form of vitamin D labeled with the nonradioactive isotope deuterium and two nonradioactive calcium isotopes. Young men were fed diets high in fiber and low in calcium, and the metabolism of labeled calcium and vitamin D was followed. The study showed that the breakdown of vitamin D was twice as fast as had been demonstrated previously using less accurate methods. Large amounts of dietary fiber reduced calcium absorption from the diet and slowed down calcium metabolism in bone. The rate of vitamin D breakdown was faster when calcium absorption was poor. The realization that vitamin D is degraded more rapidly infers that the recommended intake for this vitamin should be increased.

- National Nutrient Data Bank

The HNIS successor laboratory in ARS continues to maintain and expand components of the National Nutrient Data Bank (NNDB) as the primary mechanism for collecting, evaluating, storing, and collating data on the nutrient composition of foods. Products of the NNDB are reference values for over 60 food components in thousands of foods Americans consume. They are presented in machine-

readable form and in published tables and reports. The products are widely used not only in the United States but throughout the world. Of special importance are (1) Agriculture Handbook No. 8, *Composition of Foods...Raw, Processed, Prepared*, and its corresponding machine-readable version, the USDA Nutrient Data Base for Standard Reference; (2) the data bases prepared for use in assessing the nutrient content of diets reported in nationwide surveys that are part of the National Nutrition Monitoring and Related Research Program; and (3) the National Nutrient Data Base for Child Nutrition Programs, a new data base developed cooperatively with FNS.

The NNDB is continually expanded to include results from new analyses conducted by industry, government, and universities and results from extramural analyses funded by HNIS. Contributions of data from industry and other sources outside HNIS are voluntary, and HNIS ascertains data reliability through internal evaluations. In response to the General Accounting Office (GAO) report "Better Guidance Needed To Improve Reliability of USDA's Food Composition Data," HNIS began to prepare new evaluation criteria for analytical data being considered for entry into the NNDB.

For analyses conducted under contracts, data reliability is emphasized by (1) evaluating performance on check sample analyses during the contractor selection process and on monitoring sample analyses during contract performance; (2) requiring validated analytical methods and documented quality control procedures during contract performance; and (3) monitoring results after analysis of characterized reference materials.

Emphasis is on food components believed to be important to health promotion and disease prevention. Research priorities focus on filling information gaps in the data base and on monitoring the composition of foods determined by nationwide surveys to be major contributors to the population's intake of specific nutrients. Extramural contracts in 1993 focused on foods used by various ethnic populations. Specialized research also continued on fatty acids (including trans fatty acids), dietary fiber, sugars, and vitamin E (tocopherols and tocotrienols).

HNIS worked with representatives of the National Live Stock and Meat Board, Texas A&M University, and the University of Maryland to develop nutrient values representing beef trimmed to 1/8 inch of fat. These data will be used by the food industry to develop nutrient labels under new requirements of the Food Safety and Inspection Service, and they will be made available publicly through release on the NNDB electronic bulletin board as part of Agriculture Handbook No. 8 and the USDA Nutrient Data Base for Standard Reference.

Work began on activities relating to the redesign of the Nutrient Data Bank System (NDBS). Since the system's implementation in 1985, an internal assessment indicated that some activities are not adequately supported. An outside expert was retained to review the current system, suggest other areas for improvement, and work with staff to develop design objectives for the new system. A group comprising other nutrient data users in the Federal Government was also formed and provided input about its needs and expectations for the NDBS. The NDBS redesign will also take advantage of improvements in computer technology.

- Agriculture Handbook No. 8, Composition of Foods...Raw, Processed, Prepared

HNIS continued revision of *Composition of Foods...Raw, Processed, Prepared*, Agriculture Handbook No. 8 (AH-8), by issuing the fourth in a series of supplements. The 1992 supplement contained new or revised data for 59 food items in 11 sections of the book including: dairy and egg products; spices and herbs; fats and oils; poultry products; soups, sauces, and gravies; vegetables and vegetable products; finfish and shellfish products; legumes and legume products; baked products; snacks and sweets; and fast foods. Several items were foods used primarily in recipes of ethnic origin, for example, Mexican cheeses.

- Nutrient Data Base System for Large-Scale Dietary Intake Surveys

HNIS was responsible for maintaining the Survey Nutrient Data Base System for developing and documenting special data bases to assess the nutritional content of diets reported in USDA's Continuing Survey of Food Intakes by Individuals and in the DHHS's National Health and Nutrition Examination Survey.

The Survey Nutrient Data Base System was reprogrammed to operate within a relational data base management system for regular updating and maintenance. Several format enhancements were made to the electronic *Food Code Manual*, which is part of this system, including provision for unique food codes for individual brands and the creation of central data bases for measure description and gram weight conversions. A comprehensive review and improvement of the *Food Code Manual* was begun and includes revisions, as necessary, of food and measure descriptions, as well as laboratory confirmation of many volume-weight equivalents. Many additional items were added to the manual and to the nutrient data base for foods reported for the first time by survey respondents, including many foods of ethnic origin.

- National Nutrient Data Base for Child Nutrition Programs

HNIS and FNS began a cooperative project to develop a special nutrient data base to support nutritional analysis of meals reimbursed through the FNS school lunch and breakfast program. This data base is being used in a national school lunch project that began with the 1994-95 school year. Sources of data are the USDA Nutrient Data Base for Standard Reference, USDA values for commodity foods, calculations of quantity-food school lunch recipes, and data submitted by the food industry for foods targeted for use in the school lunch program.

- National Nutrient Data Bank Electronic Bulletin Board

The NNDB Electronic Bulletin Board, developed by HNIS as a public service, allows individuals and institutions to electronically transfer food composition data releases from HNIS to their own computers. Also available on the bulletin board is information about HNIS publications and announcements about relevant conferences. In cooperation with the University of Maryland, the bulletin board is accessible over the Internet, which makes it instantly and inexpensively available to universities and other research institutions in the United States and other parts of the world. The information is updated and revised monthly.

In 1993, the bulletin board received an average of over 350 calls per month. The monthly average for data files being downloaded to other computers was over 300. Calls were received from nearly every State and from some foreign countries. Release 10 of the USDA Nutrient Data Base for Standard Reference (the machine readable version of AH-8) and releases 5 and 6 of the Survey Nutrient Data Base were added to the list of available data files. A revised data set based on a new revision of the vitamin K provisional table was also made available. Other files currently on the Bulletin Board are the Dietary Analysis Program; the data from Home and Garden Bulletin No. 72, "Nutritive Value of Foods"; Home Economics Research Report No. 48, "Sugar Content of Selected Foods"; and the Provisional Tables on Selenium, vitamin D and vitamin K. Also available are several data sets of interest to nutrient data users prepared by the Food and Nutrition Information Center at the National Agricultural Library.

3. Bioavailability

- Improved In Vitro Method for Assessing Iron Bioavailability

Iron deficiency anemia is generally considered the most widespread nutritional deficiency in the United States. This is due, in part, to the fact that only 5-10 percent of dietary iron is bioavailable (available for absorption and utilization).

Improving iron bioavailability has been hampered by poor understanding of the factors regulating iron absorption. Scientists at the U.S. Plant, Soil and Nutrition Laboratory in Ithaca, NY, developed a system for estimating bioavailability that involves simulated digestion of a food or a meal, followed by measurement of iron uptake by intestinal epithelial cells grown in single-layer cell cultures. This model should prove very useful in improving understanding of the factors that limit iron bioavailability. It could also provide an inexpensive means of screening foods and meals for iron bioavailability. Improved knowledge of the factors limiting bioavailability and an inexpensive screening method would contribute to a reduction in the incidence of iron deficiency anemia.

- Stearic Acid, a Component of Meat, Promotes Iron Utilization

Meat contains a factor that promotes iron absorption and utilization in humans. Identification of this factor would be helpful for making recommendations to alleviate iron deficiency, a significant nutritional problem worldwide. Researchers at the Grand Forks Human Nutrition Research Center obtained evidence that stearic acid—a fatty acid found in meat, especially beef—is such a meat factor. When compared to safflower oil, stearic acid added to the diet of iron-deficient dogs doubled radioiron absorption and significantly increased the movement of iron into the blood and the production of red blood cells. Thus, not only does red meat supply iron, it contains a substance that enhances iron utilization by the body. By including red meat in their diets, people are observing a dietary practice that will prevent iron deficiency.

- Zinc Absorption Greater from Beef Than from a High-Fiber Breakfast Cereal

Information about the bioavailability of zinc from different foods is important in deciding how much of the mineral should be consumed daily to meet a person's zinc needs. Scientists at the Human Nutrition Research Center on Aging studied how much zinc is absorbed from two different foods—hamburger and a common high-fiber breakfast cereal. They found that zinc absorption is about fourfold higher from hamburger than from the breakfast cereal. This finding is important because it suggests that more zinc-rich foods may need to be included in the diet of persons who consume lower amounts of meat and higher amounts of dietary fiber. In addition, the findings suggest that cereal manufacturers should consider the merits of adding zinc to their high-fiber breakfast cereals.

- Correlations Between Dietary and Plasma Carotenoids in Women

Ascertaining the relationships between dietary intake of nutrients and the resulting concentration in plasma and

tissues is critical to understanding the potential impact of nutrients and other food components on health. The diet-plasma relationships for carotenoids were examined by nutrition scientists at the Beltsville Human Nutrition Research Center in 98 nonsmoking, premenopausal women. Both a food frequency questionnaire and 7-day diet records, in conjunction with the newly developed USDA-National Cancer Institute food composition data base, were used to calculate dietary intakes of carotenoids. The mean daily intakes of carotenoids were significantly higher when estimated from questionnaires than from diet records. Plasma carotenoid concentrations were measured and beta-carotene, lutein, and lycopene were the major plasma carotenoids. Significant correlations between dietary intake and plasma concentrations of carotenoids were observed for alpha-carotene, beta-carotene, beta-cryptoxanthin, lutein, lycopene, and total carotenoids. These observations indicate that plasma carotenoid levels reflect dietary intake and suggest that following the dietary guideline of "choose a diet with plenty of vegetables, fruits, and grain products" may increase plasma carotenoids that may be beneficial to health.

- Improving the Mineral and Protein Quality of Corn Using Unique Genes

Corn is an important food source for people and animals, both in the United States and worldwide. Corn seeds contain low levels of the amino acids lysine and methionine and low levels of certain mineral nutrients (calcium, iron, zinc), when compared to dietary requirements of people and some animals. Increasing the levels of lysine and methionine and the levels of essential minerals in corn kernels would be beneficial to humans and animals in many parts of the world. Mutant corn lines, which contain the opaque-2 gene, have extra lysine and methionine. Also there are lines of corn with the Mal (multiple-aleurone layer) gene that have more than one row of aleurone cells. The aleurone layer is where most of the mineral elements are found, and increasing either the thickness of the aleurone cells or the number of layers would increase the mineral content of the seeds.

Scientists at the Plant, Soil and Nutrition Laboratory at Ithaca, NY, found that incorporation of the opaque-2 gene into inbred lines of corn increased not only lysine and methionine but also calcium, magnesium, iron, zinc, and manganese. Incorporation of the Mal gene also increased concentrations of several essential mineral nutrients. The findings suggest that appropriate combinations of these genes could improve the nutritional value of corn with respect to protein quality and mineral nutrient content.

E. Food and Nutrition Monitoring Research

- Ten-Year Comprehensive Plan for Nutrition Monitoring and Related Research

The National Nutrition Monitoring and Related Research Act of 1990 required the Federal Government to develop a Ten-Year Comprehensive Plan for Nutrition Monitoring and Related Research. As required by law, the plan was transmitted by the President to Congress, and was published in the Federal Register on June 11, 1993. The plan serves as the basis for planning and coordinating the activities of 22 Federal agencies responsible for nutrition monitoring and related research activities. The primary goals of the plan are to ensure that the agencies participating in the National Nutrition Monitoring and Related Research Program collect data that are continuous, timely, and reliable; coordinate data collection with other member agencies; use comparable methods for data collection and reporting of results; and conduct research on the issues and topics relevant to monitoring the nutrition and health status of the population and subgroups at nutritional risk. The plan identifies nearly 70 activities to complement or expand nutrition monitoring and related research.

The "1993 Ten-Year Comprehensive Plan: Approach and Progress Document" was developed to assess progress made in 1993 toward implementing the activities of the 10-year comprehensive plan and provides an update to the 1992 document.

Chartbook I: Selected Findings from the National Nutrition Monitoring and Related Research Program is the first chartbook published by the Interagency Board for Nutrition Monitoring and Related Research. Publication of a nutrition monitoring chartbook as an interim report to the more comprehensive scientific reports is an activity listed in the Ten-Year Comprehensive Plan. The chartbook contains 64 reports from interagency board agencies that highlight a sampling of recent findings or trend data from the surveys and monitoring activities of the national nutrition monitoring program. The chartbook was well received at a professional presentation at the 1993 annual meeting of the American Public Health Association and is being widely distributed to users of nutrition monitoring data.

1. U.S. Food and Nutrient Supplies

- Nutrient Content of the U.S. Food Supply

Food supply determinations are one of five components of the National Nutrition Monitoring and Related Research Program. ERS determines the amounts of food available for consumption annually in the United States. Foods are at a preprocessed or commodity level when per capita use is determined. HNIS estimates per-capita per-day levels of food energy and 24 nutrients and food components in the

U.S. food supply. Estimates of the nutrient content of the food supply are derived by using data on quantities of foods available for consumption and data on the nutrient composition of foods. Nutrient levels represent what is available for consumption. The nutrient content of the U.S. food supply series dates continuously from 1909. A departmental report, "Nutrient Content of the U.S. Food Supply, 1909-1988" (HERR No. 50), published in 1992 was revised in 1994 and is entitled "Nutrient Content of the U.S. Food Supply, 1909-1990" (HERR No. 52). This revision includes revised estimates for the years 1909-1988, as well as new estimates for 1989 and 1990. Substantial change has occurred in the U.S. food supply during this century both in the quantities of food available from selected food groups and the nutrients available from these groups. Additionally, these estimates reflect the development or revision of methodologies, the incorporation of more recent food composition data, and the release of updated data on food use. A fact sheet describing the food supply also was revised. HNIS placed U.S. food supply nutrient data on the USDA-HNIS Electronic Bulletin Board.

- Food Disappearance

ERS annually estimates the amount of food available for human consumption in the United States in a historical series that is the only source of time-series data on the supply of food available for consumption in this country. These estimates are derived from calculating the total supply of a given commodity and subtracting exports and nonfood uses. More precisely, the data estimate disappearance of food into the marketing system. Hence, they are often referred to as "food disappearance."

Total supply is obtained by adding imports and beginning stocks to production. This figure, minus exports, shipments to the U.S. territories, livestock feed, seed requirements, nonfood industrial use, and yearend stocks, yields food disappearance. The per capita supply is calculated by dividing total annual disappearance by the July 1st U.S. population, including the Armed Forces overseas. Here are some highlights of changes in per capita food supplies between 1970 and 1992.

In 1992, Americans used an average of 114 pounds of red meat, 60 pounds of poultry, and 15 pounds of fish and shellfish (equivalent boneless) per capita. That's 18 pounds less red meat, 26 pounds more poultry, and 3 pounds more seafood per capita than in 1970. Annual per capita use of eggs declined 24 percent between 1970 and 1992, from 309 eggs to 234. The aging of the baby boomers and a growing preference for soft drinks brought a 6-gallon decline since 1970 in annual per capita use of beverage milk to 25.3 gallons in 1992. Per capita use of soft drinks increased 81 percent during the same period, to 44.1 gallons in 1992, and per capita use of beer increased 23 percent, to 22.8 gallons. The trend toward lower-fat milks was pronounced: In 1970,

per capita use was 25.5 gallons of whole milk and 5.8 gallons of low fat and skim. By 1992, it was 9.8 gallons of whole milk and 15.6 gallons of low fat and skim. However, Americans used the same amount of milkfat per person in 1992 as in 1970 because of their yen for cheese (per capita use rose 15 pounds from 1970-92, to 26 pounds) and cream products (per capita use rose 3 pounds, to 8 pounds). Growing interest in healthy eating and convenience, significant growth in in-store and retail bakeries, the mainstreaming of ethnic foods, and a host of new products spurred a 38 percent increase in annual per capita use of flour and cereal products from 1970-92. Per capita use of fresh potatoes declined 21 percent from 1970-92, as consumption of frozen potatoes doubled, to 26 pounds per person (retail weight) in 1992. In contrast, total per capita use of 22 other major commercial fresh vegetables in 1992 was 24 percent above the 1970 level. Fresh fruit use gained similarly. Total per capita use of caloric sweeteners increased 20 pounds (dry basis), or 16 percent, during 1970-92, from 123 pounds to 143 pounds.

For more complete information on the food supply series, see *Food Consumption, Prices, and Expenditures, 1970-92* (ERS SB-867, September 1993).

2. Food Consumption Surveys

- Food Consumption

Nationwide Food Surveys (NFS) is an umbrella term for several different types of surveys conducted by ARS (formerly in HNIS). The surveys address the requirements of the National Nutrition Monitoring and Related Research Act of 1990 for continuous monitoring of the dietary status of the U.S. population, including the low-income population. During 1993, work continued on several different but concurrent nationwide surveys, each in a different stage of the survey process. Survey activities continued in the following areas: (a) continued release of data from the 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII), the 1989-91 Diet and Health Knowledge Survey (DHKS), and the 1987-88 Nationwide Food Consumption Survey; (b) monitoring contractor performance in preparation for the 1994-96 CSFII/DHKS, including a pilot study conducted in 10 areas of the United States; (c) developing plans for collecting data on household use of food; (d) developing and/or updating in-house systems for tracking data collection, monitoring response rates, coding food, and analyzing survey results; and (e) research on determinants of dietary status and on survey methods. Progress on the surveys is as follows:

- a. **Continuing Survey of Food Intakes by Individuals**

This survey measures the kinds and amounts of foods eaten by Americans. The 1994-96 CSFII, which began in January 1994, is being conducted by Westat, Inc., Rockville, MD,

under contract to HNIS. The target population consists of noninstitutionalized individuals in all 50 States and Washington, DC. The 1994-96 CSFII has been designed to replace the individual intake component of the Nationwide Food Consumption Survey (NFCS) which was the subject of a GAO report. Every facet of the new survey has been thoroughly reviewed and redesigned if necessary. In particular, procedures for improving response rates have been established. HNIS has put in place strong management and quality control procedures both as part of the contract and in its in-house operations to assure that the survey provides accurate data in a timely manner. During 1993, a successful pilot study was conducted in 10 areas of the country. The pilot study provided an opportunity to test, evaluate, and improve, as needed, all of the procedures and materials associated with the survey. Response rates for the pilot study were high.

- Tracking System

An automated in-house tracking system has been created to monitor contractor work, verify receipt of survey deliverables, and document data flow in the CSFII 1994-96. Weekly progress reports from the contractor of response rates and other key elements will be confirmed using the electronic data transmitted. Electronic data and hardcopy questionnaires will be matched to ensure that all records are received. A program to catalog questionnaire receipt and trace location in data processing activities was tested in the pilot study and will be in place for CSFII 1994. Automated quality control checks were developed to detect errors in the survey data received from the contractor. The application of these checks to the weekly transmissions of data will allow for early intervention if coding or processing problems are discovered. This approach will allow data preparation by HNIS to be ongoing and will expedite public data release.

- Survey Net

Survey Net, a computerized system for on-line coding and entry of food intake data, which was tested and evaluated by HNIS in 1992, was provided to the contractor for use with the CSFII 1994-96. The contractor used Survey Net successfully for the CSFII pilot study conducted during 1993. This system permits HNIS to continually monitor the quality of survey data as it is collected, and to generate the periodic reports measuring actual performance of coders and supervisors.

- Food Grouping System

The Food Group System (FGS) is a modular system under development that will classify foods reported in USDA's food consumption surveys with recipes for those foods, separate each food into its ingredients, and regroup its ingredients by selected characteristics for further analysis. The System can be used to estimate the consumption of

specific foods, ingredients, or agricultural commodities by individuals. Existing files and programs were used in 1993 to provide 1987 commodity data on cereal grains to FDA, 1989 serving intake data of fruits and vegetables to NCI, as well as specific commodity data to other researchers in both Government and academia. Additionally, FGS data on food mixtures from NFCS 1987-88 were published in the 1987-88 NFCS 1 day report and data on food mixtures from CSFII 1989 were used in a presentation on 3-day total vegetable nutrient intake.

- Servings Project

The purpose of the Servings Project is to develop a method for measuring how well Americans are doing in terms of meeting food Guidance recommendations in USDA's Food Guide Pyramid. Food consumption surveys provide information in terms of grams, but the Pyramid gives recommendations in terms of servings. The method developed will translate grams consumed into servings per day from the five major food groups in the Pyramid. It will provide information on the number of Americans who meet recommendations for each food group, and on differences between those who meet and fail to meet recommendations. Because of the complexity of food consumption survey data, such information has not been available previously. However, the Food Grouping System (see above), a tool developed at HNIS, now makes the project feasible. The results will greatly improve nutrition monitoring capabilities by enhancing ability to interpret data from Federal surveys on what Americans eat. The policy applications are numerous. Results will provide data for monitoring progress towards meeting Federal nutrition objectives for the year 2000 on intake of fruits, vegetables, grains, and dairy products. They will aid the Dietary Guidelines Advisory Committee in assessing any needed changes in the 1990 Dietary Guidelines for Americans. And, they will be invaluable in developing and targeting nutrition education programs. HNIS has collaborated with the National Cancer Institute in developing the Servings Project methodology and in initial work to assess servings consumed of fruits and vegetables. Preliminary fruit and vegetable data were presented in July 1993 at the Public Health Conference on Records and Statistics that was sponsored by the National Center for Health Statistics, DHHS.

- Data Release

Data tapes from the 1990 and 1991 CSFII have been released to the public (the 1989 data tape was released in 1992); the data tape for 1991 provides information for individuals wishing to combine all 3 years of data into one data set. Two publications and several articles reporting results from these surveys are in various stages of production.

Results indicate that diets in the late 80's and early 90's differed considerably from those in 1977-78. In 1989-91,

we ate more mixtures that were mainly meat, poultry, fish (such as hamburgers, stews, and chicken sandwiches) and fewer separate cuts of beef and pork. We drank less whole milk and more lowfat and skim milk than a decade earlier (overall about 60 percent of the milk we drink now is lowfat/skim compared with about 25 percent in 1977-78). We ate fewer eggs. We ate more grain products, especially grain mixtures, cereals, and pastas. We drank more carbonated soft drinks, especially low-calorie soft drinks. In 1977-78, people drank nearly twice as much of both milk and coffee as they did of soft drinks; in the most recent survey, the amounts of milk, coffee, and soft drinks were almost equal. But fruit and vegetable consumption changed very little—despite dietary advice to eat 2 to 4 servings of fruit and 3 to 5 servings of vegetables daily—almost half of the population ate no fruit on the first day of the survey and almost a quarter ate no fruit over 3 consecutive days during the most recent survey period.

Survey results indicate that individuals are consuming a lower fat, higher carbohydrate diet now than they were in 1977-78. However, the proportion of our food energy that comes from fat (about 34-35 percent of calories) is higher than recommended by the Dietary Guidelines for Americans (30 percent or less of calories from fat). The wide array of foods consumed in 1989-91 provided the Recommended Dietary Allowances (RDA) for many nutrients, but not for others. Average nutrient intakes for most population groups exceeded the RDA for protein, vitamin A, vitamin C, thiamin, riboflavin, niacin, folate, vitamin B₁₂, and phosphorus. For other nutrients—vitamin B₆, vitamin E, calcium, iron, magnesium, and zinc—intakes were below the RDA for many population groups.

b. Diet and Health Knowledge Survey

The objective of the DHKS is to measure attitudes and knowledge about diet and health among Americans. The survey provides information for understanding factors that affect food choices and contributes information needed for developing and targeting nutrition education materials and programs. The DHKS 1994-96, which began in January 1994, is being conducted as a telephone followup to the CSFII 1994-96; data collection was included in the contract for the CSFII 1994-96 and collection of DHKS data was included in the pilot study conducted in 1993 (see above). The DHKS 1994-96 will include the collection of data from adults 20 years of age and older, rather than from only main meal planners/preparers as in 1989-91.

Data from the 1989, 1990, and 1991 DHKS have been released on the same tapes that include the CSFII 1988-91 to facilitate analysis of the relationship between an individual's intake and his or her attitudes and knowledge about diet and health. Several publications and articles reporting results from the DHKS are in various stages of production.

Results from the 1989-90 DHKS suggest that perceptions and reality about diet do not always match. For example, about 41 percent of meal planners thought the level of fat in their diets was "about right" and 49 percent thought their diets were "about right" in saturated fat, yet only 25 percent of the meal planners actually met recommendations in the Dietary Guidelines for Americans for fat and saturated fat. These results have implications for nutrition education—individuals who believe their current intake levels are about right may see no need to act on their diet-disease awareness and change their dietary practices.

c. Household Food Consumption Survey

An interagency agreement was established with the U.S. Bureau of the Census for the planning and conduct of a Household Food Consumption Survey (HFCS) which was intended to collect data on the amount and cost of foods used over a 7-day period by U.S. households. The planning of the HFCS involved the development of a Statement of Work and research on the HFCS questionnaire. In cooperation with the Demographic Surveys Division (DSD) and the Demographic Statistical Methods Division (DSMD) of the U.S. Bureau of the Census, HNIS completed a draft Statement of Work for the conduct of the HFCS. At approximately the same time, the Center for Survey Methods Research (CSMR) of the U.S. Bureau of the Census and the HNIS worked cooperatively to modify the food list for the household component of the 1987-88 Nationwide Food Consumption Survey questionnaire for use in the HFC. CSMR completed preliminary research on the content and organization of the food list. Findings suggest that new methodologies may be needed to collect this type of data. A recommendation has been made to examine alternative HFCS methodologies. Currently, a date has not been established for the conduct of the survey.

d. Nationwide Food Consumption Survey

Three reports from the NFCS were released: (1) Food and Nutrient Intakes by Individuals, 1 Day, 1987-88; (2) Evaluation of Nonresponse in the 1987-88 Nationwide Food Consumption Survey; and (3) Changes in Food Consumption and Expenditures in Low-Income American Households During the 1980's.

Low-income Americans increased their consumption of dairy products, poultry, fish and shellfish, fresh fruits and vegetables, frozen vegetables, fruit and vegetable juices, and beverages during the 1980's. On the other hand, low-income households ate less fats and oils, flours and cereals, bakery products, red meats, eggs, sugars and sweets, and canned vegetables. Per-person spending in low-income households, when adjusted for inflation, fell for nearly all products despite some fairly dramatic increases in consumption. Spending increases occurred for dairy products, frozen fruits and vegetables, and juices, while beverage spending

remained about the same. These aggregate trends mask the fact that some demographic groups of low-income Americans ran counter to overall trends.

e. Research on Determinants of Dietary Status and Survey Methods

• Estimating the Distribution of Usual Intakes of Foods and Nutrients

Under a cooperative agreement with HNIS, statisticians at Iowa State University have developed a method for estimating the distribution of long-term usual nutrient intakes in a population using short-term dietary intake data. CSFII data were used in developing the method. The method allows, for example, the determination of the proportion of a population group that has a long-run average intake of a particular nutrient above and below a recommended level when as few as 2 days of intake data are available for individuals in a sample. Work has begun on the difficult problem of estimating the distribution of usual intakes of foods.

• Exploring Methods for Improving Reporting of Dietary Intake by Children

Under a cooperative agreement with HNIS, a small-scale exploratory study was conducted by the Survey Research Center at the University of Maryland, College Park, to investigate alternative data collection strategies for children age 6 to 11 years. Results indicated that children can report for themselves, but survey procedures and questionnaires need to be modified and validated. Information should be obtained from other knowledgeable sources to get a complete report.

• Income and Food Expenditure Important in Dietary Status

The objective of this research conducted at Washington State University under a cooperative agreement with HNIS was to determine how households characteristics are related to food expenditures and dietary status. Participation in food programs generally improved the dietary status of the household. Those households headed by a male and female or a female typically had more favorable values for the dietary status variables. Female-headed households, however, did not fare so well for iron and calcium. Canning or growing fruits and vegetables for home use tended to positively impact nutrient demand.

• Changes in Food Consumption and Expenditures in Low-Income American Households During the 1980's

Low-income Americans increased their consumption of dairy products, poultry, fish and shellfish, fresh fruits and vegetables, frozen vegetables, fruit and vegetable juices, and

beverages during the 1980's. On the other hand, low-income households ate fewer fats and oils, flours and cereals, bakery products, red meats, eggs, sugars and sweets, and canned vegetables. Per-person spending in low-income households, when adjusted for inflation, fell for nearly all products despite some fairly dramatic increases in consumption. Spending increased for dairy products, frozen fruits and vegetables, and juices, while beverage spending remained about the same. These aggregate trends mask the fact that some demographic groups of low-income Americans ran counter to overall trends. *Changes in Food Consumption and Expenditures in Low-Income American Households During the 1980's* (Lutz et al. 1993, SB-870) presents information on the quantity and dollar value of food consumption in low-income American households for 1977-78, 1979-80, and 1987-88 by selected socioeconomic and demographic characteristics. The major changes over the decade were tabulated for 64 major food groups and compared with other studies to gain further insights into possible explanations for the consumption shifts. Data are from the household component of the 1977-78, 1979-80, and 1987-88 Nationwide Food Consumption Surveys (NFCS) conducted by HNIS. The tabulations are based on actual reported usage of foods from home supplies, with adjustments for meals eaten away from home. Due to the possibility of sampling bias associated with low response rates in the 1987-88 NFCS, it was recommended that these findings be verified with other data sources before making definitive claims of changes in household consumption behavior.

• Nutrient Intakes of Healthy Older Women

The effect of demographic characteristics, health habits, and social contacts on the nutrient intakes of healthy older women was studied in Kansas. The Recommended Dietary Allowances (RDA's) were used to determine adequacy of intake for energy, protein, calcium, phosphorus, iron, vitamin A, thiamin, riboflavin, niacin, and vitamin C. The levels of nutrient intake were judged as inadequate if one-fourth of the study participants received less than 75 percent of the RDA. The means for all the nutrients, except energy, were above the RDA for women over age 51. Forty-three percent of the study participants failed to get at least 75 percent of the RDA for energy.

Calcium and riboflavin were the only nutrients that were significantly higher for women living alone than for women living with a spouse. There were no significant differences in smoking, physical activity, or maintenance of a healthy body weight by living arrangement. However, women living alone were more likely to have fewer social contacts than women living with a spouse. The variance in nutrient intakes was estimated with multiple regression analysis for the independent variables of age, income, living arrangement, education, smoking, physical activity, weight-for-height, and social contacts. Among these, education, physical activity, and smoking were the most important

predictors of nutrient intakes. In general, nutrient intakes of healthy older women appeared to be adequate, with the exception of energy and calcium.

F. Government Policies and Socioeconomic Factors

• Consumer Education Activities on Food Safety

As a consequence of the mid-January 1993 outbreak of severe food poisoning that led to four deaths and several other incidents of foodborne illness that were traced to undercooked hamburgers, the U.S. Department of Agriculture required safe handling information on raw meat and poultry products. On November 4, 1993, FSIS published a proposed rule on mandatory safe handling statements on labeling of raw meat and poultry products. The rule provides additional safeguards to protect consumers from exposure to possible bacterial contaminants found in raw meat and poultry.

This action was taken in an effort to reduce the risk of foodborne illness, by educating the public on proper handling of raw and cooked meat and poultry products.

The FSIS Office on Information and Legislative Affairs operates a toll-free meat and poultry hotline, which assists the general public, group leaders, and reporters with expert food safety advice. For 1993, the hotline staff published food safety education advice in *Newsweek*, *Better Homes and Gardens*, *McCalls*, *Ladies Home Journal*, *American Health*, *Mature Outlook*, and *Parenting*. Staff made appearances on morning news and entertainment programs, including Good Morning America, CBS This Morning, and Live with Regis and Kathie Lee.

Ten video and 8 print news releases on seasonal food safety topics were produced at regular intervals throughout the year.

• Potential of Increasing the Food Stamp Program (FSP) Participation Rate

Currently about 40 percent of households eligible for the FSP do not enroll. Recent reports by the Government Accounting Office indicate that approximately one-half of these households do not know they are eligible. Researchers at ERS estimated that informational outreach programs which would make eligible nonparticipants aware of their eligibility have a maximum potential of increasing FSP participation by approximately 18 percent and benefit payments by 13.4 percent. Further research focuses on how expenditures on informational outreach programs can be spent in order to maximize expected FSP participation.

• Defining and Measuring Persistent Poverty

County-level census data can be used to identify nonmetropolitan counties that had high poverty rates in each of the last four censuses, 1960-1990. In "Poverty Is Persistent in Some Rural Areas" in *Agricultural Outlook* (ERS AO-200, 1993), such counties are defined as having persistently high poverty. A county with a high incidence of poverty is defined as having 20 percent or more of its population living in households with poverty-level income.

Statisticians measure the size of the poverty population by comparing total money income to a poverty threshold that varies by size of the household. Poverty thresholds are adjusted annually by the Consumer Price Index. No allowances for regional variations in costs of living are available. Illustrative poverty income thresholds from the 1990 census are: less than \$6,451 for a person under 65, \$8,343 for a two-person household with the head under 65, and \$12,575 for four persons, including two children under 18 years. Income includes wages and salaries and other earned income, as well as that received from cash transfer payments, such as Social Security, public assistance, retirement or disability income, or child support. While the threshold measures poverty after the receipt of cash assistance, it excludes the cash value of such programs as public housing, food stamps, and Medicare. Thus, the data overstate the incidence of poverty after accounting for all ameliorative programs, but they underestimate the number of people who would be poor without public income support.

Among nonmetro counties, 540 have had poverty levels of 20 percent or more in each of the last four censuses. This is nearly a fourth of all nonmetro counties. The national incidence of poverty was 13.1 percent in the 1990 census, based on 1989 income, up slightly from 12.4 percent in 1980. For nonmetro areas, the figure of 16.8 percent in 1990 increased from 15.4 percent in 1980. The poverty rate in nonmetro counties of persistently high poverty was 28.7 percent, twice that of all other nonmetro counties (14.4 percent).

A map of persistent-poverty nonmetro counties shows large numbers in the coastal plain and highlands regions of the South, along or near the Rio Grande from its source to its mouth, in portions of the Texas plains, and in scattered counties elsewhere. Persistent-poverty counties are not found in the Northeast or on the Pacific coast and are rare in the Corn Belt. In terms of demographic and cultural geography, the vast majority of the counties fall within four types. They are counties in which the source of the high overall poverty rate is primarily in the black population, the Hispanic population, the American Indian or Alaskan native population, or the population of the southern highlands (mostly in the Cumberland plateau and highland rim country of the southern Appalachians, but also including parts of the Ozark plateau and the Ouachita Mountains).

The greatest progress in reducing the occurrence of poverty level incomes since 1960, has been made in the black and southern highlands areas. Starting at similar levels of poverty in 1960 (59.8 and 59.1 percent), those areas were down more than half to 27.6 and 29 percent in 1990. This is a major change. However, all the progress occurred from 1960 to 1980. In the decade from 1980 to 1990, the poverty rate in the southern highlands areas reverted to a higher level, rising from 26.4 to 28.8, and the rate in the black poverty counties rose slightly from 27.2 to 27.6.

Far less improvement has occurred in the Hispanic and Indian areas, where somewhat less than half their populations lived in poverty in 1960 (47.1 and 48.2 percent, respectively), but rates remain above 30 percent today (31.8 and 34.2).

In these persistent-poverty nonmetro counties, 2.7 million people and the incidence of poverty becomes in itself an impediment to self-generated progress. The poverty limits the tax base and imposes a poverty of services. The lagging education of the labor force makes it difficult to attract new jobs other than those require low skills and pay modest wages. And the distinctive racial or cultural context of most of the persistent-poverty areas makes it clear that larger problems cannot be solved without addressing specific problems.

- Long-Term Care for the Elderly

Despite the tremendous amounts of money being allocated to long-term care, the needs of all elderly Americans are not being met. The present system of providing and paying for long-term care is fragmented and confusing. The Family Economics Research Group in Beltsville, MD, Maryland, analyzed data and concluded that over 8 million elderly Americans will need some type of long-term care by the year 2000. To help with these long-term care needs, numerous public programs, particularly Medicaid and Medicare, have been developed and expanded. Public programs paid for 50 percent of nursing home care and 74 percent of home health care in 1990. The recent availability of long-term care insurance policies through private companies has not yet had a big effect on long-term care, since only 3 percent of the elderly had policies by late 1991. The United States does not have adequate mechanisms for helping families anticipate and pay for long-term care. Greater awareness of the various community services available to the elderly is needed.

- Income and Consumer Expenditures of Hispanic and Black Elderly Women

Demographic trends indicate an increasing number and proportion of elderly women are members of minority groups. Using 1989-91 consumer expenditure survey data, the ARS Family Economics Research Group studied

incomes and expenditures of Hispanic, black, and white consumers with a female reference person or spouse 65 years or older. The average income of black households was \$11,872; Hispanics, \$16,570; and white, \$18,932. On average, black households spent 62 percent and Hispanic households spent 87 percent as much as white households (\$17,154). On an average per capita basis, blacks spent 53 percent and Hispanics spent 72 percent as much as whites (\$10,211). As black and hispanic elderly women are an increasing proportion of the elderly population and have a substantially lower level of income and expenditures than white women, they may merit special attention from policymakers and educators.

- The Food Practices of Families Maintained by Single and Married Mothers Have Similar Food Shopping Behavior and Diet Quality

Families maintained by single mothers are a growing proportion of all families with children. These families are also one of the more economically distressed groups in the United States. The ARS Family Economics Research Group examined self-reported food adequacy and expenditures, food shopping behavior, and diet quality of families maintained by single mothers and married couples. Data are from the 1989-90 Continuing Survey of Food Intakes by Individuals. Although single mothers viewed the food adequacy of their household less positively than did married couples, their food expenditures were not appreciably different, especially when noncash benefits were taken into account. Most single mothers shopped infrequently. Overall, the diets of single and married mothers and their children, as measured by food variety, fat/cholesterol moderation, and nutrient intake, were found to be lacking. Results suggest that nutrition education programs that consider the income constraints and food shopping behavior of single-parent families are needed.

G. Food and Nutrition Information and Education Research

- The School Nutrition Dietary Assessment Study

This study sponsored by FNS, examined the nutrients and foods provided in school meals and determined the dietary intakes of the nation's students on a typical school day. The study collected information from a nationally representative sample of 545 schools and 3,350 students attending those schools. Schools provided information about all meals served during a 1-week period between February and May 1992, as well as information about their food-service operations. Approximately 3,350 students in grades 1-12 provided detailed information about the foods and beverages they consumed during a 24-hour period that included a school day.

The study compared the nutrients provided in school meals and the nutrients consumed by students with several

standards: the RDA's that are used to plan school meals, recommendations for fat and saturated fat from the *Dietary Guidelines for Americans*, and sodium, cholesterol, and carbohydrate recommendations of the National Research Council published in *Diet and Health*. A final report was issued in October 1993. Some findings are presented below.

Calories from fat in meals as offered—38 percent—and saturated fat—15 percent—exceeded the Dietary Guideline goals of 30 percent or less from fat and less than 10 percent from saturated fat, while providing one-third or more of the RDA for key nutrients and calories. Virtually no schools conformed to the *Dietary Guidelines for Americans* goals for fat and saturated fat. Only 1 percent offered lunches that provided an average of 30 percent or less of calories from fat. Less than 1 percent provided an average of 10 percent or less of calories from saturated fat.

On average, all students' daily intake on a typical school day exceeded the RDA for calories—a finding that held for all income groups. The average daily percent of calories from fat consumed by all students was 34 percent and 13 percent from saturated fat. Students from low-income families had higher percentages of calories from fat than students from higher-income families. At the lunch meal, National School Lunch Program (NSLP) participants consumed an average of 37 percent of calories from fat and 14 percent of calories from saturated fat, while students who consumed lunches from sources other than the NSLP consumed 33 percent of calories from fat.

- The Dietary Change Research Model

Research using the Dietary Change Research Model continued. The mathematical model measures the change required in food consumption patterns of Americans to meet specified nutritional recommendations. Information provided by the model can help professionals gain insight into strategies for implementing a group of nutritional recommendations. A recent study assessed the changes needed in the diets of adult women to meet the 1989 RDA and other recommendations from the National Research Council. An article describing the model and this research project was published in the May 1993 issue of the *Journal of the American Dietetic Association*.

- Research Base for the Food Guide Pyramid Publication and Graphic

Release of the Food Guide Pyramid, which illustrates the Food Guide developed by HNIS in the early 1980's, generated considerable interest in the research on which the guide is based. The goals and research base for the food guide were recently updated based on the 1990 *Dietary Guidelines for Americans* and 1989 Recommended Dietary Allowances. In 1993, *USDA's Food Guide: Background and Development* (MP-1514) and two research articles in *Nutrition Today* were released. These publications detailed

the history of USDA food guides from 1916 to 1980, the philosophical goals for a new food guide, and the steps involved in developing the research base for the food guide (establishing nutritional goals, defining food groups, assigning serving sizes, determining nutrient profiles, and determining the number of servings of each food group). The publications also discussed the rationale behind developing a new graphic for the food guide and the communications research and evaluation study that led to selection of the pyramid as best graphic to represent the food guide. In addition to conveying the concepts of variety, proportionality, and moderation, the pyramid conveyed less misinformation than the other graphics tested. Examples of how the pyramid has been used to date, in both USDA and private sector educational materials, were also presented. A presentation on the history of food guides in USDA and development of the research base for the Food Guide Pyramid was given at the W.O. Atwater Centennial Celebration Symposium, Washington, DC, June 1993. A paper based on this speech was prepared and submitted for publication in the *Journal of Nutrition*.

The American Dietetic Association (ADA) acknowledged the importance of the research leading to the development of the Food Guide Pyramid by presenting its President's Circle Award to HNIS at the 1993 ADA annual meeting. The ADA is the most prominent professional nutrition association, with a membership of over 60,000 nutritionists and dietitians. The President's Circle Award is given annually to honor one individual or group for work in nutrition education.

- Food Guide Pyramid Data Base

In an effort to make research and resources on the Food Guide Pyramid more available to nutrition researchers and educators, HNIS undertook a new initiative with the National Agricultural Library (NAL) to create a specialized data base. The Food Guide Pyramid Data Base is a computerized listing of nutrition education materials that feature the Food Guide Pyramid and of nutrition education research articles that focus on the pyramid. In addition to facilitating the use of the pyramid as an educational tool, this system will also assist researchers and educators by helping them identify research and information gaps. Materials are listed in the data base with the source, ordering information, description, language, target audience, and keywords. The data base includes brochures, posters, videos, textbooks, curriculum guides, training manuals, and food labels. Listings for the data base are obtained from consumer groups, industry associations, health professional associations, universities, private companies, and government agencies. Searches of the data base, available on request by NAL's Food and Nutrition Information Center staff nutritionists, can locate information about specific projects related to the pyramid. The data base is updated continuously and currently includes over 200 entries. The data base

report can be accessed through the HNIS and NAL electronic bulletin boards.

- Research on Analytical Methodology

To formulate effective dietary guidance, HNIS studied the extent to which Americans follow dietary recommendations and the factors that influence their dietary status. Data on food consumption from USDA and DHHS surveys and data on knowledge and attitudes toward diet and health from USDA and FDA surveys were used in research projects. Various methods of analyzing data were studied and disseminated, as appropriate. For example, a research symposium on Use of National Survey Data for Nutrition Education Research was held at the Society for Nutrition Education Annual Meeting, St. Paul, MN, July 1993. The purpose of this symposium was to stimulate use of USDA data for nutrition education research by researchers in the academic, government, and private sectors. USDA researchers provided information on the USDA data, particularly data from the Diet and Health Knowledge Survey and Continuing Survey of Food Intakes by Individuals (DHKS/CSFII) and provided information on appropriate statistical methods for analyzing the data. They also discussed how the DHKS/CSFII could be used to examine the relationship of food and nutrition-related attitudes and knowledge to dietary behavior, using concepts derived from major theories of behavior change. University and government researchers presented findings from studies conducted in cooperation with HNIS that utilized DHKS/CSFII data.

- Dietary Patterns: Implications for Nutrition Education

A cooperative research project with the University of North Carolina was completed. Data from the Nationwide Food Consumption Survey 1987-88 were used to examine the relationship of eating patterns as defined by the location of food consumption (home, restaurant, fast-food, etc.) to dietary status. A final report was submitted. One major finding was a rise in the proportion of individuals who consume substantial portions of their daily calories at fast-food locations in 1987-88, compared to 1977-78. While overall mean fat intakes by men and women declined between 1977 and 1987, only small decreases in fat intake were found in the diets of individuals in the fast-food pattern.

- Assessment of "Healthy Eating"

Two major research efforts were initiated: (1) to develop the research base for an overall measure of diet quality for the U.S. population and population subgroups (a "Healthy Eating Index") and (2) to identify knowledge, attitude, and behavior-related questions primarily from the Diet and Health Knowledge Survey (DHKS) that are accurate "Indicators of Healthy Eating" defined as following current dietary recommendations. In preparation for the "Indicators

of Healthy Eating" project, a contract was signed with Market Research Corporation of America to identify DHKS-type questions that estimate "Healthy Eating" well. To the same purpose, a grant was awarded to the Cooperative Extension System (CES) to further their development of a questionnaire to assess the effect of nutrition education programs. While CES efforts focus on the development and use of indicator questions that examine knowledge and behavior of adults participating in CES diet, nutrition, and health programs, the results should be readily applicable to the "Healthy Eating" project. Measurement tools were developed for four of the Dietary Guidelines: eat a variety of foods; (2) maintain healthy weight; (3) choose a diet low in fat, saturated fat, and cholesterol; and (4) choose a diet with plenty of vegetables, fruits, and grain products. ARS will participate in workshops to evaluate the data collected and plan future collaborative efforts.

- Television Viewing, Activity Level, and Weight Status

A research project looked at the relationship between hours spent watching television and weight status as indicated by the Body Mass Index (BMI). Those who watched more television were found to have a higher BMI even after controlling for potentially confounding variables, such as activity level, dietary intake, age, and smoking. Results were presented at the Experimental Biology 93rd Annual Meeting and at a workshop on issues related to healthy weights sponsored by the American Institute of Nutrition and the Office of Disease Prevention and Health Promotion, DHHS. Results were published in the *FASEB Journal* and in the *Chartbook I* of the Interagency Board for Nutrition Monitoring and Related Research.

- Food Safety and Nutrition Concerns

A research study was completed that utilized data from the 1990 DHKS/CSFII to examine characteristics associated with various types of food safety concerns was completed. Results were presented at Northeast region resource economists (NE165) workshop "Valuing Food Safety and Nutrition," Alexandria, VA, June 1993. Among the major findings were that characteristics associated with lower levels of concern about food safety were higher education levels of the male head of household (when present), outside employment of the female head of household (when present), and being in a household headed by a male only. African-Americans had higher levels of concern about food safety than white Americans, other things being equal.

- Vegetable Intake

This question of vegetable consumption was assessed using food consumption data from USDA's surveys and partially completed files and procedures from the Food Grouping System (FGS). Use of the FGS, an analytical system that has been in development for several years, allowed for the

first-time reporting of total vegetable consumption from all food mixtures and exclusion of nonvegetable ingredients from vegetable products. Results indicated that, on average, individuals consumed about 2-1/2 to 2-3/4 servings of vegetables per day, below the recommendation of 3-5 servings per day. Results were presented at the American Dietetic Association annual meeting, Anaheim, CA, October 1993. In addition to being of interest to nutrition educators, data such as these on the total intake of specific commodities are of interest to the Environmental Protection Agency (EPA) and the FDA, which are concerned about exposure to pesticides and other food safety issues.

- Economic and Sociodemographic Correlates of Food Consumption

Cooperative research was concluded with the University of California-Berkeley on the relationship between economic and sociodemographic factors and households' food consumption patterns. A final report was submitted. A major finding was that sociodemographic factors explain only a small proportion of the variation in food choices and dietary status. Perhaps other types of data, such as awareness of diet and health issues or the belief that one can control one's diet, may be more explanatory of food choices.

- Development of Nutrition Education Research Theory and Methodology

The goal of this research is to understand and measure the impact of nutrition research and education activities on the continuum of changes in behavior leading eventually to a diet that promotes health and well-being. There are several theories of behavior change, for example, the health belief model, the social learning theory, the diffusion of innovation model. Findings from a project to investigate current nutrition education research theory and methodology and suggest approaches for improvement were presented in the speech "Quantitative Nutrition Education Research: Approaches, Findings, Outlook" at the W.O. Atwater Centennial Celebration Symposium, Washington, DC, June 1993. A paper based on this speech was submitted for publication to the *Journal of Nutrition*.

- The Food Label as an Educational Tool and Research on Nutrition Label Use

Research on use of the nutrition label continued. Information on how USDA survey data can be used for food label research was presented at the National Exchange for Food Label Education Meeting (NEFLE), Washington, DC, June 1993. NEFLE is a forum created jointly by FSIS and FDA to encourage and build partnerships to develop and evaluate educational materials and projects that reach all segments of the U.S. population. Results from these and other research projects are being incorporated into a reference guide on

new nutrition labeling regulations. The publication is targeted for information multipliers—food editors, writers, extension staff, and other health professionals and educators—who will be explaining to their audiences how to use the new food label in conjunction with the Food Guide Pyramid to choose a healthful diet.

Results of a research study on characteristics of nutrition label users were presented at the annual meeting of the Society for Nutrition Education, St. Paul, MN, July 1993. Results of a follow-up project on the effects of nutrition label use on diet quality were also presented at that meeting. Among major findings were the following: 1. Label use was positively associated with nutrition knowledge and with belief in the importance of following the principles of the *Dietary Guidelines for Americans*. Label users were more likely to believe that it was important to moderate cholesterol, fats, saturated fat, and sodium, and to increase complex carbohydrates, fiber, and variety (contrary to the popular belief that consumers only use the label to avoid specific components). 2. Label use was positively associated with intake of vitamin C and negatively associated with intake of cholesterol.

- Research on the Food Situation of Single Adults

In collaboration with ERS, researchers from HNIS examined the food expenditures, food shopping behavior, and diet quality of single adults and compared them to those of adults in multiperson households. A manuscript entitled "Dietary Quality of Adults Living in Single Versus Multiperson Households" was submitted for publication to the *Journal of Nutrition Education*. Among major findings were that diets of adults living alone were significantly lower in food energy, protein, total fat, saturated fatty acids, phosphorus, calcium, and sodium; however, diets of women living alone were significantly more nutrient-dense in vitamins A and B₆, carotene, riboflavin, folate, and magnesium, than diets of females living in multiperson households; diets of men living alone were more nutrient-dense in niacin, folate, and vitamin B₆.

- Research on the Food Situation of Single-Mother Families

ARS and HNIS researchers examined the food expenditures, food shopping behavior, and diet quality of families maintained by female single parents. A paper summarizing their findings was prepared and submitted for publication to *Family Economics Review*. Among major findings were (1) children of single mothers are substantially less likely to consume fruit or fruit juice on a given day than children with married mothers (37 percent versus 53 percent, respectively), and (2) compared with married mothers, single mothers were substantially less likely to report daily usage of three food groups: fruit and fruit juices, vegetables, and milk and milk products.

- Implications of Changes in the U.S. Food Supply for Nutrition Education

HNIS assessed trends in the per capita food and nutrient supply in relation to current dietary guidance. The development and implementation of strategies to increase awareness, understanding, and use of the food supply data continued, with emphasis on interpretation and documentation for policy applications. To accomplish this objective, three separate presentations were given to different audiences. A poster session presented at the annual meeting of the American Home Economics Association compared the nutrient content of the U.S. food supply between 1909-14 and 1988. Comparisons indicated that levels of protein remained stable; total fat increased substantially; carbohydrates decreased; vitamin A, carotenes, vitamin E, vitamin C, thiamin, riboflavin, niacin, vitamin B₁₂, calcium, and iron all increased, while levels of cholesterol, carbohydrate, folate, magnesium, zinc, copper, and potassium decreased.

A paper presented at the annual meeting of the Society for Nutrition Education focused on the interrelationship between the composition of foods in the American food supply and dietary recommendations. Improvements in technology and changes in marketing have helped to meet consumer demand. Some of that demand is related to the nutritional properties of foods. For example, between 1909-14 and 1988, per-capita per-day thiamin levels increased from 1.6 mg to 2.2 mg largely because of the enrichment of white flour; per capita quantities of low-fat fluid milk increased from 60.9 to 116.2 lb/yr; the development of vegetables rich in carotene contributed to the rise in per-capita per-day vitamin A (RE) levels from 1,210 to 1,630.

A speech presented at the Eastern Food Science Conference discussed antioxidants in the American diet. Between 1978 and 1988, antioxidant vitamins increased in the food supply: vitamin A from 1,500 to 1,630 RE, carotenes from 580 to 770 RE, vitamin C from 108 to 118 mg, and vitamin E from 14.6 to 16.7 mg. These changes reflect a greater per capita use of vegetables high in carotene, of fruits, and of salad and cooking oils.

- Food Supply Methodology Changes and Improvements

Several improvements were made in the food supply methodology. Revisions are ongoing to update estimation of nutrients added to the food supply in fortification and enrichment. This year procedures for estimating the amounts of vitamin A added to the food supply through the fortification of milk products were revised. Procedures for calculating the nutrients contributed by per capita poultry consumption were revised to reflect the increased use of selected chicken parts (breasts, legs, and thighs) as opposed to whole birds; the decreased use of giblets, which now are used mostly by renderers and pet food companies; and changes in moisture loss during processing.

Because food supply data are important indicators of the capacity of the food supply to meet nutritional needs and because of the emphasis on fruit and vegetable consumption in the Food Guide Pyramid, HNIS staff, using data generated by ERS specialists, began to fill some data voids for 1982-91. During these years, USDA stopped reporting per capita values for many fresh vegetables because production data were not available on a national level. Per capita estimates have now been reinstated for cabbage, green peppers, cucumbers, green beans, cantaloupe, artichokes, eggplant, garlic, and watermelon. Because of the fast growth of chili peppers as a specialty produce item in the last decade, the method used to calculate the nutrient contribution of spices was revised. Chili peppers are now considered individually, rather than as a member of a miscellaneous group of spices. Chili peppers are excellent sources of vitamins A and C.

- Research To Develop and Maintain USDA Food Plans at Different Cost Levels

Each month, the cost of four USDA food plans—thrifty, low cost, moderate cost, and liberal cost—are estimated for the 48 conterminous States. These estimates are based on updated food price information from the Bureau of Labor Statistics. Results are released monthly by the Department in press releases. Benefit levels for the food stamp program are established by USDA using the food costs estimated for the thrifty food plan. Food costs are also estimated for Alaska and Hawaii to establish separate benefit levels for the food stamp program in those two States. Food plan costs for the United States are published in the *Statistical Abstract of the United States, 1993*, (U.S. Department of Commerce, Bureau of the Census). The cost of food in the thrifty food plan for the four-person household, which is used by the Department in setting food stamp benefits, increased 2.6 percent between June 1992 and June 1993.

- Assessment of Nutrition Education Needs of Pregnant Teenagers

A study with the University of Tennessee, Knoxville, assessed the nutrition education needs of pregnant teenagers. Based on this assessment of needs, a 10-minute prototype video was developed dealing with healthful eating during the second trimester of pregnancy. The video was focus-group tested with the target audience, and their reactions to the video were very positive. The pregnant adolescents easily identified the major messages on the video—eating for the baby's and the mother's health, how to make better food choices. The presentation style used on the video—babies, teen actresses, real food like teens eat—caught and maintained the adolescents' interest. Finally, the adolescents considered the video suitable for teens like themselves; this perception did not differ among girls by race, urban/rural environment, socioeconomic status, or region of the country (Minnesota vs. Tennessee).

Unfortunately, due to revised budget priorities, HNIS was not able to refine, reproduce, and distribute the prototype videotape as originally planned.

- Food Preparation Research

Ongoing research in HNIS's Food Research Laboratory provided information for guidance materials that show consumers how to implement the dietary guidelines in food preparation. Moderation of fat, saturated fatty acids, cholesterol, sugars, and sodium requires modification of ingredient amounts and techniques for food preparation. For example, a recent research study indicated that muffins and yellow cake made with moderate levels of fat and sugar were as acceptable in eating quality as those made with typical levels of fat and sugar. The study also found that drop cookies could be made with moderate levels of fat without reducing the level of sugar. As a result of this study, specific guidelines for preparing muffins, cakes, and drop cookies using moderate levels of fat and sugar were developed and published in a report in the November 1993 *Journal of the American Dietetic Association*.

Research continues to show that consumers want recipes in nutrition education materials. Recipes provide a practical hands-on way to communicate dietary guidance information. All recipes developed for publication or through research are evaluated by a trained taste panel for appearance, texture, flavor, and overall acceptability. Recipes also emphasize basic food safety rules and how to choose and prepare foods moderate in cost, with a minimum of effort, in keeping with today's lifestyles.

Recipes were recently developed to illustrate how servings of food groups in the Food Guide Pyramid are counted in mixed dishes. These recipes were incorporated into a research report for nutrition educators to use in educating consumers on how to use the pyramid in planning menus. Although consumers measure foods by volume (cups, tablespoons), foods measured by weight are required for food consumption monitoring, reports on the nutrient content of foods, and recipe development work. The Food Research Laboratory develops data to convert the volume measurements into weight measurements.

- Evaluation of HNIS's Dietary Guidelines Teaching Kit for Home Economics Teachers

In 1988, HNIS developed a dietary guidelines teaching kit designed for use by junior and senior high school home economics teachers. A study assessed the use and effectiveness of the kit as an instructional resource and identified additional instructional needs. Brief interviews with home economics teachers examined courses in which the kit was used, grade level and number of students reached, teacher satisfaction with kit components, and suggestions for improvement. In-depth interviews focused on topics such as

the kit's effectiveness in communicating with culturally diverse youth, adapting the kit for use with younger children, and communicating concepts like nutrition labeling and USDA's food guide in future materials.

The teaching kit was rated very highly by the teachers surveyed; it was described as organized, well-sequenced, easy to follow and understand, detailed, and comprehensive in scope. Suggestions for improving it generally related to wanting more materials—more hands-on learning activities, more reproducible handouts, more tests and activity sheets, more food laboratory activities, and more recipes. Because time constraints were the major barrier to using the kit effectively, teachers were also interested in having information on how to condense or simplify specific lessons and how to prioritize objectives and activities within a given lesson.

- Nutrition Label Education for Consumers

Based on research on the information needed to help consumers use the new food label as a tool in achieving a healthful diet, HNIS prepared a brochure to identify label features that consumers can use to follow the *Dietary Guidelines for Americans*. This publication is part of the educational outreach of the National Exchange for Food Labeling Education and is intended to be a companion to the FDA-FSIS brochure "Read the Label, Set a Healthy Table—An Introduction to the New Food Label," which was released in December 1993. The HNIS brochure is available from USDA (Home and Garden Bulletin Number 266).

- Guidance on Implementing the Dietary Guidelines

A series of eight bulletins that provide specific information to help consumers understand the 3rd edition of the dietary guidelines and put them into practice was released in July 1993. This series, "Dietary Guidelines and Your Diet" (HG 253-1 through 8), was written and designed for those who plan, purchase, and prepare food. The 96-page set includes 7 bulletins, each of which focuses on one guideline, but emphasizes all 7 guidelines in selecting a healthful diet. Also included in the set is an overview bulletin that introduces all seven Dietary Guidelines and the Food Guide Pyramid. During development, three of the bulletins were evaluated by focus groups of adults. They reacted favorably and found the bulletins to be informative, useful, and convenient. Many focus-group participants especially liked the use of humor in the illustrations because they thought these lightened and made enjoyable a topic that is often presented in a boring manner. Ease of reproducibility was a consideration during development of the bulletins. They can be easily photocopied. The bulletins are also available for purchase as a set through the U.S. Government Printing Office, Washington, DC.

- Dietary Guidance for Adults with Low Literacy Skills

Research to develop a useable source of nutrition information for adults with poor reading skills to encourage them to put the *Dietary Guidelines for Americans* into practice was conducted at the University of Nebraska under a cooperative agreement with HNIS. Dietary guidelines information was adapted to a 5th to 6th grade reading level and formatted into a prototype booklet with simple line drawings. The prototype was focus-group tested with the target audience. Characteristics that were particularly well received were the single-booklet format; colorful cover showing pictures of foods; layout with professional typesetting, highlighting, boxing of key information, and clear illustrations; self-assessments; recipes with few ingredients, featuring easy desserts and main dishes; and specific information on calories, fat, sodium, and sugar contents of foods, in tables, charts, illustrations, and recipes. The publication "Making Healthy Food Choices" (Home and Garden Bulletin No. 250) was released in February 1993 and is available for purchase through the U.S. Government Printing Office, Washington, DC. The booklet can also be easily reproduced by photocopying.

- Dietary Guidance for Older Adults

HNIS and the National Institute on Aging (NIA), DHHS, released in April 1993, "Food Facts for Older Adults: Information on How To Use the Dietary Guidelines." The booklet is directed to adults about ages 60-75 who are generally in good health (not on physician-prescribed diets), live independently (not in institutions), and have at least a high school education. The 68-page booklet includes an introduction describing the dietary guidelines; an explanation of the Food Guide Pyramid; information about fat, cholesterol, and sodium; special advice on fiber and calcium; tips on making healthy food choices when shopping and cooking; suggestions for maintaining a healthy weight; answers to common questions older people ask; tips and recipes for each food group; and a resource list to obtain more information. The booklet also features illustrations throughout. Research conducted during development of this booklet included advice from a panel of professionals who work with older adults and evaluation of the booklet by focus groups composed of older adults. The publication, Home and Garden Bulletin No. 251, is available to consumers from the Consumer Information Center, Pueblo, CO. The booklet can be easily reproduced by photocopying.

- Dietary Guidelines Teaching Kit for Health Educators

"Dietary Guidelines and Your Health—Health Educator's Kit" was developed to help teach dietary guidelines concepts to junior and senior high school students. A major component of the kit is a teacher's guide that includes learning objectives, key concepts, lesson plans, and hands-on activities that focus on teaching students how to put the

dietary guidelines into action. A panel of junior and senior high school health educators assisted with format and content ideas. Since March 1993, nearly 25,000 copies of the teaching kit have been distributed. Bulk copies are being provided upon request to instructors responsible for teacher in-service training in health education. Single copies were provided to members of the Association for the Advancement of Health Education's Secondary School Health Educators Practice Group, State education school health and physical education program coordinators, State nutrition and education training program coordinators, and health education professionals attending the American Alliance of Health, Physical Education, Recreation, and Dance annual meeting. Single copies are also being distributed to health and physical education teachers upon request.

- Revision of Calories and Weight Publication

Overweight is a problem for about one-quarter of American adults and is associated with a number of chronic diseases. To reduce the risk of being overweight, both exercise and diet are important. The *Dietary Guidelines for Americans* include the guideline, "maintain healthy weight." To help consumers follow this guideline, HNIS began expansion of the publication "Calories and Weight: the USDA Pocket Guide." The publication will include information on the number of calories and grams of fat per serving in about 450 of the most frequently consumed foods, as well as general weight control guidance. The calorie and fat values for foods were calculated using current nutrient composition data for foods as eaten and weight per serving determined by the HNIS Food Laboratory staff.

- USDA's Dietary Analysis Program

Distribution of USDA's dietary analysis program continued through the National Technical Information Service (NTIS) and the HNIS Nutrient Data Bank Bulletin Board. The program was developed by HNIS in cooperation with the Extension Service for use in consumer nutrition education programs at worksites, community health centers, health fairs, etc. The program features a user-friendly, menu-entry approach for selecting foods from about 850 items commonly reported in USDA's food consumption surveys. It allows users to analyze up to 3 days of food intake for calories and 27 nutrients and food components. Program output helps consumers identify major food sources of nutrients in their diets and explore ways to change food selections to improve nutrient intakes. During 1993, the nutrient data base for the program was updated to that used in the 1980 Continuing Survey of Food Intakes by Individuals (CSFII), and plans were initiated to update it to the 1993 CSFII data base when it becomes available. Interpretive materials that accompany the software were revised to reflect changes in the 1990 Dietary Guidelines and Food Guide Pyramid recommendations.

- Great Beginnings: Multifaceted Nutrition Education Program Evaluation

The University of New Hampshire Cooperative Extension developed a nutrition education program called "Great Beginnings," designed especially for pregnant adolescents and young mothers who participate in the WIC program. This program was partially funded by and developed in cooperation with FNS; ERS is assisting in developing and implementing an evaluation process.

The analysis will develop a model for evaluation of the Great Beginnings program based on nutrition knowledge, diet quality, and selected anthropometric/health measures of the targeted individual and her infant. The evaluation will attempt to control the numerous outside forces known to interact with and influence the participant.

The Great Beginnings program is an excellent example of many of the intensive education programs targeted to high-risk groups. The evaluation will examine not only the short-term linkages from education to knowledge to changes in behavior, but also the long-term linkage to real health outcomes.

- ES/WIC Nutrition Education Initiative

Under the auspices of the ES/WIC nutrition education initiative, 17 States were awarded special project funds in FY 1993 to be used for the development, delivery, and evaluation of community-based intensive nutrition education programs for "needy" individuals participating in the WIC program.

In their plans, the awardees included an evaluation component which identified the intended outcomes in terms of clients' acquiring knowledge, attitudes, skills and behavior that reflect nutritionally sound diets and healthy lifestyles.

In July 1993, representatives from each of the 17 States met with ES, ERS, and FNS staff for an orientation to discuss evaluation and program issues. ERS was responsible for providing a cross-project evaluation and a summary report.

- Food (In)security Status

FNS set two goals: (1) determine, recommend, and develop a state-of-the-art measure for food security and its principal elements, such as hunger, and (2) develop a comprehensive research agenda on measurement issues concerning food security in the United States. These activities begin and build on National Nutrition Monitoring and Related Research Program (NNMRRP) 10-year plan, activity V-C-2.4. In order to accomplish these goals, FNS formed an interagency working group and convened regularly on food security, organized an internal food security team, planned a conference to address issues concerning food security, and contracted with the Bureau of the Census to conduct a food

security and hunger supplement on the Current Population Survey, a large ongoing national survey of 60,000 households. Long-term plans include supporting the use of the food security supplement questions on special-purpose surveys of other Federal agencies, using the questions on a planned national survey of food stamp recipients, and providing technical support and encouragement to State and local agencies and organizations in the use of these questions at those levels. Planning for the 1994 Food Security Measurement and Research Conference was completed in 1993.

- Infant Mortality Among Medicaid Newborns: An Analysis of WIC Participants and Nonparticipants in Five States

This study represents an extension of the original five-State WIC Medicaid study released by FNS in 1990, which documented savings in Medicaid costs of \$1.77-\$3.13 for mothers and newborns if mothers participated in WIC at any time during their pregnancies, along with higher average birthweights and longer gestations. The purpose of this analysis was to examine relationships between prenatal WIC participation and neonatal, postneonatal, and infant mortality.

The study found estimated reductions in infant mortality ranging from 1.2 deaths per 1,000 live births in Minnesota (not statistically significant) to 27.2 deaths in South Carolina, with intermediate values of 3.6 in Florida, 4.0 in Texas, and 8.4 in North Carolina (all statistically significant). These effects were independent of receipt of prenatal care, which was also associated with large and statistically significant reductions in infant mortality. As the adequacy of prenatal care increased, infant mortality also decreased. The study was conducted by Mathematica Policy Research, Inc., under contract to FNS.

- Menu Modification Demonstrations

FNS awarded 3-year grants to five school food authorities to conduct menu modification demonstration projects. These sites will demonstrate local-level efforts to improve the nutrient content of meals served, particularly in the areas of reducing fat and sodium. During the 1990-91 and 1991-92 school years, grantees modified recipes, food specifications, and food preparation to meet their individual fat and sodium content goals. The sites also developed various nutrition education and project promotion activities to complement the menu changes. An independent evaluation is being conducted, and data collection includes nutrient analysis of menus, plate waste measures, and 24-hour dietary recalls.

- Evaluation of the Alabama Pure Cash-Out Demonstration, the San Diego Cash-Out Demonstration, the Washington State Family Independence Program, and the Alabama Avenues to Self-Sufficiency Through Employment and Training Program

The major focus of these four evaluations was on the effects of issuing food benefits in the form of cash on recipient household expenditures, food expenditures, food use, and nutritional availability. Reports for the Alabama Pure Cash-Out and San Diego Cash-Out Demonstrations and the Alabama Avenues to Self-Sufficiency Through Employment and Training Program were released in 1992-93. A report for the Washington State Family Independence Program was released by the State of Washington.

Some tentative conclusions can be drawn about the effect of cash-out on food stamp households. First, cash-out appears to reduce household food expenditures, but the size of the reduction remains uncertain. Second, there is some evidence that cash-out reduces the availability of some nutrients; it is not clear, however, that households receiving checks are at significantly greater nutritional risk. Third, there is little evidence of any increase in the incidence of acute food shortages or deterioration in the perceived adequacy of the home food supply due to cash-out. Fourth, there is some evidence that cash-out leads to higher expenditures on some items other than food (for example, shelter, transportation, medical, and educational expenses). Finally, households that receive checks prefer them to coupons.

- Study of WIC Participant and Program Characteristics

Public Law 99-500, enacted in 1986, requires FNS to submit a biennial report to Congress on income and nutritional risk characteristics of participants. To satisfy this requirement, FNS developed and implemented a system of gathering, analyzing, and publishing WIC program information. The information includes periodic descriptions of the characteristics of State and local agencies that operate the program, as well as the characteristics of individuals and families participating in the program. Data for the 1992 report were gathered from a census of participants (over 5 million individuals) for approximately 18 data elements directly generated from ongoing management information systems serving the WIC program. The final report was released in 1994.

- WIC Dietary Assessment Validation Study

A survey of State WIC agencies conducted by FNS in 1988 showed that a wide range of methodologies were being used for dietary assessment and that few, if any, had been tested for validity and reliability. This project was initiated in September 1992 to provide the appropriate scientific data to determine which of two sets of food frequency question-

naires (FFQs) would deliver the most accurate dietary assessment in a WIC-eligible population consisting of African-American, Hispanic, and white women and children. Validity and usability of the FFQs will be assessed relative to their (1) ability to validly measure dietary intake in a manner usable to screen applicants for WIC eligibility; (2) logistic feasibility for use in busy WIC clinics and acceptability to WIC participants and staff; (3) suitability for various ethnic groups served by the WIC program; and (4) accurateness and simplicity of scoring.

- Adult Day Care Study

This FNS sponsored study provides a nationally representative description of the adult component of the Child and Adult Care Food Program (CACFP). The report provides (1) a description of adult day care centers and clients participating in CACFP, including the clients' dietary intake; (2) comparisons of centers and clients participating and not participating in CACFP; (3) an assessment of the contribution of program reimbursable meals to the dietary intakes of clients; (4) an examination of reasons for nonparticipation of centers; and (5) an assessment of prospects for program growth.

Five data collection efforts addressed these research objectives: They included a census of State agencies responsible for administering the adult component of the CACFP; a mail survey of a nationally representative sample of 564 adult day care centers, equally divided between CACFP and non-CACFP centers; an in-person survey of center staff and record abstraction for a nationally representative sample of 942 adults attending 85 day care centers participating in the CACFP; and collection of 1 week of menu data on foods offered at 85 CACFP centers. A final report was published in spring 1994.

- For-Profit Center Demonstrations

State-wide demonstrations were conducted in Kentucky and Iowa to determine what effect a change in for-profit center eligibility for the Child and Adult Care Food Program (CACFP) might have on the participation of low-income children. The change involved switching eligibility criteria from requiring that at least 25 percent of enrolled children receive Title XX subsidies to requiring that 25 percent be from families with incomes at or below 185 percent of the Federal poverty level. Centers that participated in the demonstration were required to either reduce their fees or improve the quality of meals they served.

FNS-sponsored data collection included (1) mail surveys of State agencies to collect data on budgetary impact of the change in eligibility, and outreach strategies targeted to for-profit centers, and (2) pre- and post-demonstration mail surveys of demonstration centers to collect data on characteristics of children served, meals served, and child care fees. The demonstration increased the participation of for-

profit centers in both States, increased the number of low-income children receiving CACFP in both States, and improved the quality of meals and supplements.

- The Homeless Shelter Demonstration Year 1 Report

This homeless shelter demonstration was designed to determine the feasibility of providing year-round food assistance to preschool children (under age 6) in homeless shelters. Unlike older homeless children, preschoolers do not have access to school meals. The first phase of this FNS-sponsored demonstration was initiated in 1990 in four shelters operated by the same sponsor.

Although all four shelters provided meals to residents prior to the demonstration, the quality of the meals provided to children under age 6 was enhanced, and resources were freed up so that the nutritional value of the meals of older children and adults could be improved. All shelters reported that more fruits and vegetables were served as a result of the demonstration. All children received fresh fluid milk at every breakfast and lunch; prior to the demonstration only one of the four shelters provided amounts of milk that were compatible with CACFP meal pattern requirements. Shelters reported that they incurred minimal additional expenses for the project and needed no additional staff.

- The Homeless Shelter Demonstration Year 2 Report

The Year 2 report covers FNS's 1991 expansion of the demonstration to include 8 additional sponsors and 13 additional shelters. The Year 2 study determined the feasibility of the demonstration based on the experiences of a larger number of sponsors and shelters. Feasibility was assessed by the extent to which sites complied with demonstration requirements and costs of the demonstration.

The type of sponsor did not appear to affect the capacity to administer the program. All participating shelters were able to operate the program. The majority of participating shelters reported that meal quality increased as a result of the demonstration. They added more milk, fresh fruit, vegetables, and full-strength juices.

- Low-Income Family Day Care Home Demonstration

Family day care homes that operate in low-income areas or serve primarily low-income children are underrepresented in the Child and Adult Care Food Program (CACFP). This demonstration first identified likely barriers to participation in CACFP by low-income family day care homes. It then tested three approaches to removing barriers and increasing participation. Strategy A was designed to eliminate licensing barriers (for example, licensing fees and the cost of bringing homes up to licensing standards). Strategy B was designed to alleviate program barriers by coordinating CACFP with various government and nongovernment

agencies that administer child care programs. Strategy C was designed to reduce educational, language, and distance barriers to low-income family day care homes participation. These demonstrations focused on innovative technical assistance and outreach strategies tailored to family day care homes' providers in specific populations, including providers with limited education or who operate in rural areas.

The year-long demonstration was conducted in six target areas. A pre- and posttest case study method allowed comparisons of change between target areas and either the States they were in or the sponsorship areas they were in. Measures of change focused on the number of new homes recruited and the number of homes submitting claims for meal reimbursements. Data were also collected from State agency demonstrators, their sponsors, and sponsors that conducted demonstrations.

H. Food Marketing and Demand

1. Studies on Food Supplies, Prices, Expenditures, Marketing Costs, Safety, Technology, and Consumer Demand

- Commodity Supply and Utilization

ERS annually calculates the amount of food available for human consumption in the United States, and publishes the information in *Food Consumption, Prices, and Expenditures*. The 1993 bulletin covered the period 1970-92 (SB-867, ERS, September 1993). It presented historical data on per capita consumption of major food commodities in the United States, including the basic data on supplies and disposition from which the consumption estimates are derived. In addition, information concerning population, income, prices, and expenditures related to food consumption through the period covered by the quantity data was assembled to meet the need for a comprehensive and convenient source of data for people doing statistical and economic analysis of food consumption. An electronic data base containing the data in this report is available. In addition to the historical series, ERS also analyzes the current situation and forecasts the short-term outlook for major agricultural commodities, agricultural trade, agricultural finance, agricultural resources, and world agriculture in a host of periodic outlook reports, *Agricultural Outlook* (published 11 times a year), and *FoodReview* (published 3 times a year).

- Americans Are Eating More Rice

Although rice has not historically been a major item in the American diet, U.S. consumption is on the rise and is expected to continue increasing during the rest of the 1990's. Up 76 percent in the 1980's, per capita domestic consumption is outpacing population growth. If present growth rates continue, per capita use should be at least 25

pounds by 1995. For further information, see "Americans Are Eating More Rice" in *FoodReview* (1993, 16(2):19-25), published by ERS.

- World Vegetable Oil Consumption Expands

Spurred by income and population growth in developing countries—as well as rapidly expanding food processing industries in Asia and other developing areas—world growth in consumption of vegetable oils is outpacing that of most other agricultural products. For more information, see "World Vegetable Oil Consumption Expands and Diversifies" in *FoodReview* (1993, 16(2):26- 30), published by ERS.

- Per Capita Consumption of Chile Peppers Nearly Doubled in the Last Decade

Chile peppers are one of the fastest growing specialty produce items, illustrating the changing American diet, a taste for alternative flavoring agents, and the growing influence of U.S. Latino and Hispanic populations. Americans have been eating more chiles via southwestern-style fast-food entrees, innovative new cuisines, and myriad new salsa, hot sauce, and other chile-based products. U.S. per capita consumption of chile peppers increased 84 percent in the last 10 years, from a fresh weight of 3.5 pounds to 6.5 pounds annually. Americans now consume more chile peppers, based on their fresh-weight availability, than many traditional vegetables including asparagus, cauliflower, and green peas. For further information, see "Chile Peppers Are Hot" in *Agricultural Outlook* (1993, AO-195:16-19), published by ERS.

- Vegetables for Processing

Tomatoes are the major U.S. processing vegetable in both production and per capita use. On a fresh-equivalent basis, per capita use of processing tomatoes (72 pounds) dwarfs that of fresh tomatoes (16 pounds). But use of processed tomatoes has been trending upward. California produces over 90 percent of the tomatoes for processing and manufactures most of the sauces, paste, puree, and catsup sold in retail and food service establishments. The United States is the world's largest producer of tomatoes, accounting for 16 percent of the world total. For further information, see "Vegetables for Processing" in *Agricultural Outlook* (1993, AO-200:15), published by ERS.

- Imports Account for Significant Portion of U.S. Produce Consumption

Markets for fresh fruit and vegetables are increasingly global as improved refrigeration and transportation have made it possible to expand supply sources. This increase in trade has expanded the variety and seasonal availability of fresh fruit and vegetables to U.S. consumers. In 1990, U.S. imports from all sources accounted for 12.3 percent of total

fresh fruit consumption—(excluding bananas [35.3 percent if bananas are included])—and 8.4 percent of total fresh vegetable consumption.

As trade barriers are reduced, trade in fresh fruit and vegetables likely will continue to rise. The potential of Mexico as a supplier under the North American Free Trade Agreement would also be a factor in the continuing globalization of fresh fruit and vegetable markets. In 1990, Mexico supplied about 2.5 percent of U.S. fresh fruit consumption, excluding bananas (3.3 percent including bananas), and 5.4 percent of fresh vegetables consumed in the U.S. "Fresh Produce: The Global Factor" in ERS' *Agricultural Outlook* (1992, AO-192:12-13) presents U.S. consumption, imports as a share of consumption, and imports from Mexico as a share of consumption for selected produce items.

- Imports Increase Consumption of Fresh Grapes

When Chile began exporting fresh-market grapes to the United States in the 1970's, some U.S. growers feared imports would reduce consumers' interest in grapes during California's peak shipping season from May through September. However, larger imports from December to May actually coincided with a substantial rise in total fresh grape consumption—both imported and U.S. grown. Increased domestic production of seedless grapes, higher quality, lower relative prices, extended seasonal availability, and consumer concerns about nutrition and health have led to strong and steady growth in consumption of fresh grapes. Per capita consumption, which tripled from 1970 to 1991, grew faster than other traditional fresh fruits.

Better postharvest handling has improved the quality of grapes reaching consumers. For example, growers recognize the importance of removing field heat immediately after picking, thus preserving quality and extending shelf life. Growers now pick grapes at the optimal time for ripeness and pay more attention to trimming the fruit bunches to enhance quality.

Lower prices of fresh grapes, relative to other fruit, made them a more attractive purchase for the consumer. Although the U.S. average retail price for fresh grapes rose from \$1.06 per pound in 1980 to \$1.40 in 1991, prices adjusted for inflation declined about 20 percent. Inflation-adjusted prices for citrus, on the other hand, rose about 10 percent over the same period.

"Winter Availability Boosts U.S. Grape Consumption" in *Agricultural Outlook* (1992, AO-192:14) presents annual U.S.-utilized production, imports, exports, domestic utilization, and per capita availability for marketing years 1980/81 through 1991/92.

- Static Per Capita Fresh Peach Consumption

Fresh-market peaches have not kept pace with other leading fresh fruits in domestic consumption over the last two decades. Several factors explain this phenomenon. Prices for peaches rose faster than prices for most other substitute fruit, including strawberries and grapes. Some consumers may prefer fruits that require less preparation time than peaches.

Seasonality may also explain why peach consumption has trailed that of other fresh fruits; peaches remain a summer treat. In 1992, 85 percent of the peach supply was marketed during May through September. While imports of fresh peaches, mostly from Chile, have increased during the off-season (October-April) in recent years, they have lagged imports of some other fruits. Grapes, for example, were marketed in steady quantities almost all year during 1992, with imports filling in during the off-season in the United States.

In addition, a larger selection of imported fruits has become available to the consumer during the last several decades, possibly increasing market share among these individual fruit commodities. For example, annual consumption of pineapples, half of which are imports, more than doubled from under a pound to just about 2 pounds per person during the last two decades. Annual consumption of mangos, which are mostly imported, climbed from 0.05 pound to about half a pound per person.

In 1992, Americans consumed approximately 6.3 pounds of fresh peaches (including nectarines), about 3.5 pounds of canned peaches, and just under half a pound of frozen peaches. Canned peach consumption has declined since the 1970's, reflecting growing consumer preference for fresh fruit over canned. For further information, see "Peaches Cut Seasonal Slice of the Fruit Market" in *Agricultural Outlook* (1993, AO-197:20-22), published by ERS.

- Nutrition Concerns, Food Consumption, and the Food Sector

Over the past decades there has been an increase in consumer awareness of the relationship between diet/nutrition and risk for chronic diseases, such as heart disease and cancer. Nutrition has emerged as an important factor in consumers' food choices and as a marketing tool for the food sector. Consumers claim to have made a number of changes in their eating patterns in order to improve the healthfulness of their diets, such as eating less red meats and eating more chicken and more fruits and vegetables. Data from the U.S. food disappearance series confirm some of these trends in specific commodities, although little research is available on how consumer awareness and concerns about nutrition have affected dietary intake.

ERS's research focused on the effect of consumer awareness of the relationship between fat intake and health on the intake of fat and dietary patterns. Because no data were available at the time that provided a measure of awareness of fat-disease relationships and actual food consumption behavior for the same individual, the researchers combined data from two surveys. First, they used data from FDA's 1986 and 1988 Health and Diet Surveys to estimate a probability model of awareness, using the Health and Diet Surveys participants' demographic characteristics as explanatory variables. They then coupled the fitted probability awareness model with demographic characteristics of respondents to USDA's food intake surveys (the 1985 and 1986 Continuing Survey of Food Intake of Individuals and the 1987-88 Nationwide Food Consumption Survey) to predict a probability of awareness for those respondents. This predicted probability was then included as a variable in the analyses of food consumption behavior and fat intake.

The analyses suggested that the predicted probability of awareness was associated with systematic changes in dietary behavior. Women with higher probabilities of fat-disease awareness were less likely to consume red meats and consumed a smaller share of fat from eggs and egg dishes. These women were more likely to consume added fats, dressings, and sauces; poultry, fish, and seafood; baked and frozen desserts; salty snacks and peanut butter; and fruits and vegetables. However, the predicted probability of awareness did not significantly affect intake of total fat, saturated fat, or cholesterol, despite the observed systematic changes in food behavior. Although the data indicated that average fat intake has declined since 1977, those groups with higher fat-disease awareness showed no greater reduction in fat intake than others. In other words, the larger dietary changes made by the group of women with higher fat-disease awareness probabilities had little effect on their total fat intake relative to other groups of women. Consumers may be having difficulties making effective food substitutions in their diets, perhaps due to insufficient knowledge about the relative fat content of different food groups. For more information, see "Consumer Awareness of Diet-Disease Relationships and Dietary Behavior: The Case of Dietary Fat" in the *Journal of Agricultural Economics Research* (1994, 45(1):3-17), published by ERS.

More research is needed to understand the complex link between diet-disease awareness and actual dietary practices. HNIS and ERS currently are using data from HNIS's 1989-90 CSFII to evaluate the effect of diet-disease awareness on attitudes and specific nutrition knowledge, and, in turn, their effects on food consumption behavior. For further information, see the January-April 1994 issue of *FoodReview*, published by ERS.

- America's Changing Eating Habits

Patrick O'Brien, director of ERS's Commodity Economics Division, presented a speech titled "America's Changing Eating Habits" at USDA's 69th Annual Outlook Conference in Washington, DC (*Proceedings of Agriculture Outlook '93*, Washington, DC, December 1-3, 1992, pp. 832-842, World Agricultural Outlook Board, Washington, DC). O'Brien used commodity disappearance data to gauge, in broad terms, how our eating patterns compare with dietary guidelines and how they are changing over time. He used survey data on food use and intake to show that eating habits vary widely among individuals and that there is considerably more potential to improve diets in some groups (such as low-income households and households with infants and children) than the national disappearance averages imply.

- Dietary Shifts and Implications for U.S. Agriculture

Patrick O'Brien presented a speech titled "Dietary Shifts and Implications for U.S. Agriculture" at the Harvard School of Public Health's 1993 International Conference on the Diets of the Mediterranean in Cambridge, MA, on January 23, 1993. O'Brien addressed two questions: (1) What changes in the demand for basic agricultural commodities would a shift toward Mediterranean-type diets generate? and (2) How would the sector adjust to meet these changes in demand? He assumed that, notwithstanding, USDA's Nationwide Food Consumption Survey data and the Department's commodity disappearance estimates are the best measures available of where we are today and how far we have to move diets to reach guideline goals. He concludes that, with a dietary shift of the magnitude contemplated, agriculture would face significant changes in the volume and mix of products it markets and in the inputs used in their production. However, the sector has a long history of adjusting to changes in food demand and the pace of change and efforts to ease the transition are likely to be as important as or more important than the magnitude of the change. Agricultural policy could be used effectively both to ease and accelerate agriculture's adjustment to demand changes.

ERS economist Elizabeth Frazao addressed similar issues in "Consumer Concerns About Nutrition: Opportunities for the Food Sector," a paper presented at the 3rd Agribusiness Conference, Sao Paulo, Brazil, September 12-15, 1993.

- Food Industry Penetrates New Markets

The recent explosion in the share of grocery store sales by membership warehouse clubs, mass merchandisers, and deep-discount drugstores has caused traditional grocery stores to modify their marketing strategies to appeal to price-conscious consumers. For more information, see "Nontraditional Retailers Challenge the Supermarket

Industry" in *FoodReview* (1993, 16(1):2-7), published by ERS.

The sluggish economy spurred stiff competition among fast-food operators who pushed for higher sales with price wars, "value meal" discounts, and expanded menus. Many are expanding abroad, but even more are making inroads to new markets at home with smaller mobile units and with outlets in schools, supermarkets, and healthcare facilities. For further details, see "Fast Food Chains Penetrate New Markets" in *FoodReview* (1993, 16(1):8-12), published by ERS.

- Female-Headed Households Spend Less on Food

Households headed by single mothers spend less money but a greater share of their income on food than do two-parent households. The lower spending is due primarily to their lower income and education levels—more so than to the absence of a male partner. Smaller household size, a larger proportion of preschoolers and a lower proportion of adults in the households, and a preponderance of black households also contributed to the lower per-person food expenditures of female-headed households. This, however, does not necessarily imply that these households have lower food consumption or nutrition.

The dramatic growth in the proportion of households headed by single women and their large representation in the food assistance population point to the need to understand the causes for the observed lower food expenditures.

Female-headed households may allocate their incomes differently than do two-parent households because there is no male head to influence food consumption patterns or spending decisions. Also, women may have different preferences than men about allocating income to food. Food spending in female-headed households would reflect this difference, along with other factors that may vary, such as how they allocate their time.

Because few studies have been able to reconcile the effects of differences in household characteristics when examining food expenditures, ERS conducted its own analysis, using data from the U.S. Department of Labor's 1988 Continuing Consumer Expenditures Survey. The study took into account differences in income, education, household composition, full-time work, race, season, and region, and measured their effects on food spending. For further information, see "Female-Headed Households Spend Less on Food" in *FoodReview* (1993, 16(2):6-11) published by ERS.

- Household Characteristics Affect Food Choices

National trends in food consumption often mask the fact that the eating habits of some American households run counter

to those trends. Household characteristics—such as income, type, and size—influence the type and quantities of foods used. For further information, see “Household Characteristics Affect Food Choices” in *FoodReview* (1993, 16(2):12-18), published by ERS.

- Food Prices Rose the Least in 25 Years

The rise in retail food prices slowed dramatically in 1993 under the pressure of large food supplies and the weak economy's dampening effect on food demand. Food prices in 1992, as measured by the Consumer Price Index, averaged 1.2 percent above those in 1991, less than half the 1991 increase of 2.9 percent. Moreover, the 1992 increase was the lowest since that in 1967, when the index rose 0.9 percent.

For the second consecutive year, food prices in 1992 rose more slowly at supermarkets and other grocery stores than at eating places. Food prices in grocery stores rose only 0.7 percent, and prices for restaurant meals advanced by 2 percent. In both cases, prices increased much more slowly than they had the year before. While prices were up slightly overall, grocery store prices of some foods in 1992 were lower than those in the year before. These foods included meats, poultry, and eggs. Price hikes were largest for cereals, bakery products, and dairy products.

A variety of factors kept food price increases small in 1992. Changing consumer spending habits, lower inflation, and larger supplies of food played important roles. Slow growth in consumers' real income and low consumer confidence held down food spending, particularly for high-value, high-priced products and restaurant meals. The 1991 recession, followed by the slow pace of economic recovery in 1992, increasingly drove consumers to shop for the best deals.

The marketing spread (the difference between the farm value and retail price of food) consistently contributes more to food price increases than do volatile farm prices. Higher costs for labor, packaging, energy, and other marketing inputs push the spread wider nearly every year. But the 1992 rise in the farm-to-retail price spread was only 2 percent, substantially smaller than that of recent years. This small rise can be attributed partly to a lower general inflation rate.

Another factor holding down food prices was lower farm prices of some commodities, particularly hogs and fresh fruits. Overall, there was a 2.5-percent decrease in the farm value of food commodities in 1992, the second consecutive yearly decline. The effect of change in commodity prices on retail prices depends on what proportion the farm value is of the retail price. That share varies from less than 10 percent to around 60 percent, depending on the food. On average, the farm value share of retail dollars spent at grocery stores in 1992 was 26 percent.

Food prices in 1992 rose less than prices for most other consumer products and services. Among major items in the Consumer Price Index, housing prices (the largest component) went up 2.9 percent, apparel and upkeep prices rose 2.5 percent, and medical care costs climbed 7.4 percent in 1992. In 6 of the past 10 years, the CPI for food rose by a smaller amount than it did for all items. For further information, see *Food Costs...From Farm to Retail in 1992* (ERS, AIB-669, April 1993).

- The Farm-to-Retail Price Spread

Consumers, farmers, and legislators want to know what causes food prices to change. These concerned parties are also interested in the difference between what farmers get for the food they sell and how much consumers pay for that food, commonly referred to as the farm-to-retail price spread. To answer these concerns, Congress directed USDA to measure price spreads for food originating on U.S. farms. An ERS report presents USDA's findings for 1992, including answers to the following questions: How much are food costs changing? Why? How much of the consumer food dollar goes to the farmer and how much to food processors and marketers? How did farm-to-retail price spreads change in 1992, both for a market basket of food and for such food groups as meat and dairy products? How have recent developments affected food industry costs, profit margins, and productivity? How much did Americans spend for farm-produced food, and how were these dollars divided among costs of producing and marketing food? For further analysis, see *Food Cost Review, 1992* (ERS, AER-672, September 1993).

- Food Prices

ERS forecasts the Consumer Price Index for all food, food away from home, and food at home, including 16 subaggregates of food at home. An annual forecast is released in late November or early December each year at the National Agricultural Outlook Conference. Updates appear in *Agricultural Outlook* (ERS, monthly) and are available from ERS economist Ralph Parlett (202-219-0862).

- Total Food Expenditures

Americans spent \$601 billion for food in 1992 and another \$86 billion for alcoholic beverages. Away-from-home meals and snacks captured 45 percent of the U.S. food dollar in 1992, up from 34 percent in 1970 and 24 percent in 1950. ERS prepares annual statistics of total dollar expenditures for food at home and away from home. These figures include all food, regardless of who pays for it. Total food expenditures are further broken down into the share paid for by families and individuals and those paid for by governments and businesses. Annual statistics are published in

Food Consumption, Prices, and Expenditures and monthly figures in *Agricultural Outlook*, both published by ERS.

• Effects of Price and Income on Food Demands

Consumer demand for food is an important component of the structure within which various agricultural policies have been formulated. To provide a model for food consumption forecasts and analyses of food program effects, a complete set of food demand relationships consisting of direct- and cross-price elasticities, and expenditure (income) elasticities was computed. An ERS report, *A Complete System of U.S. Demand for Food* (TB- 1821, September 1993), in addition to improving methodology, updates and revises the demand elasticity estimates for a disaggregate U.S. food demand system published in 1985.

The developed methodology was successfully applied to the estimation of a U.S. food demand system of 39 food categories and 1 nonfood sector using annual data from 1953-90. The results containing 1,680 estimates of price and expenditure elasticities and time trends provide a better understanding of the interdependent nature of food demands in the United States. Among these estimates, the direct-price elasticities for major meats are beef and veal (-0.6212), pork (-0.7281), and chicken (-0.3723); this means, for example, that a 10 percent increase in the price of beef would reduce beef consumption by 6 percent. Their corresponding income elasticities are beef and veal (0.3923), pork (0.6593), and chicken (0.0769); this means, for example, that a 10 percent increase in per capita income would increase beef consumption by 4 percent. In contrast with a decrease in red meat consumption, the demand for poultry meats has increased, probably because of recent consumer medical and dietary concerns and increasing use of chicken in fast foods. The implication of estimates for individual food categories to the general food sector indicates that the direct-price and expenditure elasticities for food as a whole are low, -0.1850 and 0.2745, respectively.

This empirical demand system is an effective instrument for use in food consumption forecasting and related policy analyses and in monitoring the impact of food marketing conditions on consumer nutrient intakes. For conducting forecasting, one may use the information on relative changes in prices and expenditures, and forecast the quantity demanded. For program analysis, one may assume various scenarios of changes in prices and expenditures and then conduct simulation experiments for evaluation of the program effects. For monitoring the impact of food marketing conditions on consumer nutrient intakes, one may use information about the nutritive value of each food to transform the projected changes of food consumption into simulated nutrient intakes of consumers.

• Slow Growth in Food Spending Expected

U.S. food demands are projected for 1990-2010 and present and future markets are estimated in *U.S. Demand for Food: Household Expenditures, Demographics, and Projections for 1990-2010* (ERS, TB No. 1818, December 1993). The study uses Bureau of the Census data to project the likely U.S. expenditures for food in the years 1990-2010. The study incorporates census information on such demographic factors as age, race, income distribution, region of residence, season of the year, and number of persons in the household. Another factor greatly affecting food expenses is the proportion of food consumed at home or elsewhere than home. The study allows for varying estimates in the growth of the U.S. population in the next 20 years, as well as suggesting two scenarios for the increase in average income over that period of time.

The report will also be of interest to marketers. It provides guidance to farmers and food processors, as well as to those concerned with nutrition education and food policy. Also, markets for various foods are shown by demographic grouping as gaining or losing market share. The authors include suggestions for targeted marketing in broad and narrow food categories.

Present expenditures are considered first, as a base for future changes. Higher income families presently spend more for food away from home, and more on fish, cheese, and dairy products, such as ice cream, fresh fruit, and processed fruit than do households of lower income. Americans 65 and older spend more on food at home than any other age group. In Northeastern and Western States, more is spent on total food than in other sections of the country. Nonblacks spend more on every food category than blacks do, except for meat, poultry, fish, and eggs. More sweets are eaten in the fall, by about 33 percent, perhaps because of the holidays. The Northeastern States buy 50-71 percent more butter than other regions do, while the South spends the least on fruits but the most on pork.

Future food shopping will differ from that of the present. Projections can be made of future food demands of the nation, given assumptions about the population growth rate, regional migration, age distribution, and income. Growth in food expenditures in the next 20 years will be slower; from 1970 to 1990, total food expenditures grew by 39 percent. But, from 1990 to 2010, they will grow only slightly over 31 percent, and this growth will not be evenly spread over foods or demographic groupings. For example, spending on fish would increase by 13.5 percent; dairy products other than milk, cream, and butter, by 13 percent; fresh fruit, by 16 percent; and margarine, by 12 percent. The greatest gain, influenced more by the 1 or 2 percent rise in income than by any other factor, would be in food consumed away from home, which would grow by 37 percent, while food at home would increase by only 24 percent.

- Japan's Food Consumption Trends

With rapid economic growth and increasing per capita income, the Japanese are eating more food and a greater variety. On their plates today are more meats, dairy products, and processed foods. The shifts in consumption are creating opportunities for U.S. exporters. For further information, see "Japan's Food Consumption Expands and Diversifies" in *FoodReview* (1993, 16(1):30-37), published by ERS.

- Addressing Pesticide Residues

Development of regulations is underway to implement the Organic Foods Production Act. Passed by Congress in 1990, the act calls for national standards to define organic food. USDA, using recommendations from a 14-member National Organic Standards Board (NOSB), is charged with developing uniform standards for incorporation into the regulations. A significant market niche has developed in recent years for organically produced food and fiber products, with annual sales in excess of \$1 billion. Organically produced agricultural products now include textiles and coffee, as well as fruits, vegetables, and grains. In addition, wine and meats are being produced following organic production practices, but cannot be labeled "organic" until Federal standards are in place and approval is granted for wine by the Bureau of Alcohol, Tobacco, and Firearms, and for meat by USDA's Food Safety and Inspection Service. Organic food sales at the retail level increased sevenfold during the 1980's and are expected to triple by 1995, according to *Marketdata*.

A surge in acreage in organic production has accompanied the increase in market demand. A compilation of organic acreage is currently under way at USDA's Agricultural Marketing Service. "Organic Certification Standards In the Works" in *Agricultural Outlook* (ERS, AO-199, August 1993) presents a brief history of certification at home and abroad and a discussion of the issues to be resolved by the NOSB, industry challenges ahead, and options for consumers.

USDA's new Pesticide Data Program helps examine the relationship between pesticide use on the farm and residues found on produce. Monitoring of lettuce—which is consumed fresh, so any residues that would remain on the harvested produce would not be removed by processing—shows pesticide use is widespread and varied. But, few samples contained pesticide residues, most of which were below established tolerance limits. For more information, see "Lettuce Provide Indication of Pesticide Use and Residues" in *FoodReview* (1992, 15(2):2-5), published by ERS.

Despite food scientists' opinion to the contrary, consumers rank pesticide residues on produce as a major food safety

concern. According to a recent survey, many consumers preferred to buy produce tested for pesticide residues—and would pay a premium price—after receiving information about risks. Yet consumers' ability to distinguish between risk levels depended largely on their demographic characteristics and their attitudes toward health. For further information, see "Consumers Respond to Information About Pesticide Residues" in *FoodReview* (1992, 15(2):6-10), published by ERS.

- A New Technology Awaits the Marketplace

Along with the potential to give perishable food products a longer shelf life and to substitute for chemical fumigants, irradiation may offer consumers safer food by retarding spoilage and destroying microbial pathogens that cause foodborne illnesses. Yet irradiation first must overcome high investment costs, consumer wariness, and competition from other technologies. For further information, see "Food Irradiation Still Faces Hurdles" in *FoodReview* (1992, 15(2):11-15), published by ERS.

In the fall 1991, USDA approved irradiation of uncooked poultry to control bacteria that cause diseases, such as salmonellosis and campylobacteriosis. With poultry treatment costs at a few pennies per pound, the public health benefits could outweigh the irradiation costs and the longer shelf life could offer expanded export opportunities. But irradiated poultry will enter the marketplace slowly with the uncertainty over consumer acceptance and the lack of approved facilities. For further information, see "Irradiation of U.S. Poultry—Benefits, Costs, and Export Potential" in *FoodReview* (1992, 15(2):16-21), published by ERS.

2. Studies on Improving the Food Marketing System

- Consumer Awareness of Fruits and Vegetables

Marketing strategies for increasing consumer awareness of fruits and vegetables are being developed by the Nebraska Department of Agriculture with an AMS grant. The program will include in-store demonstrations and directories designed to get consumers thinking about locally grown produce when shopping.

- Farmers' Markets Reach Low-Income Families

Areas that should be emphasized to improve the nutrition of low-income families will be identified by the Montgomery State Farmers' Market in Alabama with an AMS grant. The goal is to reach public housing neighborhoods, community action programs, Headstart groups, and school lunch programs. Special activities would be designed to teach better nutritional habits, to conduct demonstration events for children and adults, and to produce educational materials and teaching tools.

- Natural/Organic Food in New Mexico

A directory of natural/organic food producers and buyers in New Mexico will be developed by that State's Department of Agriculture using an AMS grant. The directory will identify natural/organic food producers, the amount of acreage, and the products produced. Many are small farms that typically need marketing assistance. The directory will also list potential buyers (that is, cooperatives, supermarkets, natural/specialty food stores, schools, and hospitals) and their procedures for purchasing food.

III. Nutrition Education and Information Programs

The former Human Nutrition Information Service (HNIS) supported development of Federal dietary guidance policy and develops research-based dietary guidance materials for the general public, including results from research in food composition, food consumption, and nutrition education. Its activities were moved to Food, Nutrition, and Consumer Services.

The mission of the Food and Nutrition Service (FNS) is to alleviate hunger and to safeguard the health and nutritional well-being of the nation through the administration of nutrition education and domestic food assistance programs. As a component of administering 14 domestic food assistance programs with a total fiscal year 1993 budget of over \$38 billion, FNS is the largest Federal funding source for nutrition education. FNS provides grants to States and Indian tribal organizations for nutrition education in the WIC program and the child nutrition programs and provides matching funds for nutrition education in the food stamp program. FNS also develops nutrition education materials for use by food assistance program operators and provides technical assistance for the nutrition education components of sponsored programs. Select 1993 expansions and highlights are described in this section of the report. Related research and evaluation activities were described in section II.

A. USDA's Responsibility To Ensure That the Federal Government "Speaks with One Voice" When Issuing Dietary Guidance

- Preparations for Reviewing and Revising the *Dietary Guidelines for Americans*

Title III of the National Nutrition Monitoring and Related Research Act of 1990 (P.L. 101-445) requires the Secretaries of Agriculture and Health and Human Services to publish the *Dietary Guidelines for Americans* at least every 5 years. The fourth edition of the guidelines is due to be published in 1995. The guidelines serve as the basis for all Federal Government programs in nutrition. In addition, all

dietary guidance materials produced by the Government for the general population are reviewed for their adherence to the guidelines. Besides their use by the Federal Government for food, nutrition, and health programs, the guidelines are widely endorsed and used in the private sector and by the general public for nutrition education activities and programs.

First published in 1980, the Dietary Guidelines for Americans were revised in 1985 and 1990. USDA and DHHS staff began planning in 1992 for the 1995 revision process. A memorandum of understanding was signed by the Assistant Secretaries of USDA and DHHS in November 1993, to establish a Dietary Guidelines Advisory Committee (DGAC). Nominations for the DGAC were received through publication of a Federal Register notice announcing formation of the committee and requesting nominations. The Secretaries of Agriculture and Health and Human Services will select members to serve on the DGAC. The role of the DGAC will be to review current scientific and medical evidence to determine if revisions to the dietary guidelines are warranted. The committee will hold 2-3 public meetings in Washington, DC, as part of its review process. If the committee determines that revisions are warranted, it will recommend the revisions in a report to the Secretaries of USDA and DHHS, who will publish the 1995 edition.

- Promotion of the Food Guide Pyramid

The Food Guide Pyramid released by USDA has been very well received by the professional community and the public. In addition to extensive use within the Federal Government, the Food Guide Pyramid has been used by the food industry, media, educators, and others in the private sector. The 32-page booklet explaining the pyramid in detail has been widely distributed to the professional community, including the Cooperative Extension System, and is available to the public through the Consumer Information Center at a cost of \$1.00.

HNIS featured the pyramid in materials recently produced for three special audiences—teens through a teaching kit developed for health educators, an educational bulletin for low-literacy adults, and a bulletin for older adults developed with DHHS's National Institute on Aging. The pyramid graphic is being used by the food industry on labels and promotional materials. For example, a leading cereal-manufacturing company distributed over 36 million boxes of cereal displaying the graphic. Private-sector groups have used the pyramid in educational materials for various consumer audiences. Materials include posters, videos, curriculum guides, games, pamphlets, and stage shows.

Publishing companies have updated high school and college nutrition textbooks to include the Food Guide Pyramid. Trade associations, such as the Wheat Foods Council,

National Pasta Association, and the USA Rice Council, have used the pyramid in nutrition education materials for the public. The National Cancer Institute's 5 A Day For Better Health program has featured the pyramid in some of its news magazines for the media. With the advent of new nutrition labeling and therefore new packaging, it is anticipated that the Food Guide Pyramid will be even more widely used. HNIS staff have given presentations on the research and development of the Food Guide Pyramid and its uses at local and national professional meetings. HNIS staff are providing help to others developing materials and programs using the Food Guide.

B. Programs Initiated or Expanded

1. Food and Nutrition Service Programs

- WIC Program Nutrition Education Grows as Participation Increases

WIC is the largest single Federal funding source for direct public nutrition education. About two-thirds of the USDA nutrition education budget is used to provide a minimum of two nutrition education contacts to each WIC participant for each (typically) 6-month certification period. WIC is a grant program with funding that served about 60 percent of the eligible individuals as of 1991. President Clinton committed to fully funding the WIC program by 1996, and it has been increasing in size toward this goal.

In 1993, the number of individuals receiving nutrition education through WIC increased concurrent with an increase in the average monthly participation over the previous year by 500,000 women, infants, and children. Average monthly WIC participation for fiscal year 1993 was 5.9 million. More than 40 percent of U.S. families with infants receive benefits, including nutrition education, through the WIC program.

- WIC Farmers' Market Nutrition Program

Public Law 102-314, enacted July 2, 1992, established the WIC Farmers' Market Nutrition Program (FMNP), creating the 14th food assistance program to be administered by FNS. FMNP provides coupons to WIC participants, or persons on a waiting list to receive WIC services, that enable them to purchase fresh, nutritious, unprepared foods (such as fruits and vegetables) from farmers' markets. It is also intended to expand the awareness and use of farmers' markets, especially by low-income consumers.

State agencies that previously participated in the Farmers' Market Coupon Demonstration Project (FMCDP) mandated by the Hunger Prevention Act of 1988 (P.L. 100-435) were given automatic status as FMNP State agencies. New State agencies were to be brought into the program through a competitive process, dependent upon the availability of

funds. Interim FMNP regulations implementing the provisions of P.L. 102-314 were published in November 1992.

The FMNP legislation requires all States, current and prospective, to submit State plans for approval by FNS. Funds appropriated for this program are to be allocated first to the FMCDP States, that is, Connecticut, Iowa, Maryland, Massachusetts, Michigan, New York, Pennsylvania, Texas, Vermont, and Washington. Remaining funds were then to be divided to fund expansion of current sites/services and to fund new State agencies. North Carolina entered the program in 1993. Congress earmarked \$3 million of the FY 1992 WIC program appropriation for the FMNP. Three million was appropriated in FY 1993, and \$5.5 million in FY 1994.

- Food Stamp Program (FSP) Nutrition Education

FNS has been encouraging States to increase activity in nutrition education for Food Stamp Program participants, and the State nutrition education plans submitted in fiscal year 1993 for fiscal year 1994 show more than a threefold increase in planned 1994 activity to over \$7 million in Federal FSP nutrition education matching funds. Since these are one-to-one matching funds, this figure represents about \$15 million in FSP nutrition education activity at the State and local level. This follows an increase of over 90 percent from fiscal year 1992 to fiscal year 1993.

FSP matching funds are provided for State-initiated nutrition education conducted exclusively for the benefit of FSP applicants or participants, which do not duplicate USDA's Expanded Food and Nutrition Education Program (EFNEP) efforts in the States. The plans submitted by the States must be approved by the FNS regional office for matching funds. Contributions from private agencies and institutions cannot be included in the State match for the FSP nutrition education, although use of private donations and volunteer services is not discouraged.

As part of the fiscal year 1994 plan submission process conducted in 1993, FNS accepted, on a case-by-case basis, State agency requests for waivers regarding matching funds for FSP nutrition education activities. Such waivers were granted for matching with private donations of cash, space, and food provided that no endorsement of donor or product would be given in connection with the nutrition education project. Nutrition education plans for fiscal year 1994 were approved for 11 States, including increased activity for 8 States (Minnesota, New Hampshire, New York, Ohio, Oregon, Vermont, Washington, and Wisconsin), and startup of FSP nutrition education in 3 States (Michigan, Missouri, and North Carolina).

There is a diversity in the food stamp population targeted and the methodology of the nutrition education plans submitted annually. Each plan includes the description of

the activities in the program, the number and positions of staff to conduct the nutrition education program, and a description of the targeted food stamp population.

- Nutrition Education Projects in the Food Distribution Program on Indian Reservations (FDPIR)

For FY 1993, FNS requested and Congress appropriated \$135,000 for nutrition education for FDPIR. The money was allocated to each region based on FDPIR participation figures. FNS regional offices used the funds to conduct nutrition education projects at the regional office level and to solicit proposals from Indian tribal organizations and State agencies interested in conducting nutrition education initiatives.

- National Food Service Management Institute

Public Law 101-147 and Public Law 102-337 authorized the establishment of the National Food Service Management Institute through FY 1994 at the University of Mississippi to improve the quality and operation of child nutrition programs through training, technical assistance, research, and management support for child nutrition foodservice programs. Funding for FY 1990 was set at \$500,000, with appropriations of \$1.143 million for FY 1991, \$1.322 million for FY 1992, and \$1.661 million for FY 1993. Now in its fourth year of operation, the institute has provided educational opportunities through satellite programming, established a network of professionals, developed videos and materials presented in training sessions at American School Food Service Association's national convention, conducted national conference workshops on procurement and feeding children with special needs, and conducted research projects to support training needs.

- FNS Food Stamp Nutrition Education Demonstration Grants

The food stamp nutrition education demonstration grants, initiated in 1993, support the development, implementation, and evaluation of innovative community nutrition intervention programs directed to food stamp program participants. A total of \$510,373 was awarded in September 1993 to seven organizations participating in the grants. Grants were made to community action agencies, an Indian tribal organization, extension and the expanded food and nutrition education programs (EFNEP), and universities in Hawaii, California, North Carolina, Arkansas, Arizona, Tennessee, and Delaware. Every project included an evaluation component to measure the outcomes of the educational objectives developed for each project. The projects will conclude by September 1995.

The projects had one of the following objectives: (1) evaluating the effectiveness of cooking-show-format videos used in waiting rooms; (2) comparing the effectiveness of three levels of nutrition intervention including direct mail

messages, EFNEP classes, and videos; (3) developing and testing an interactive nutrition education computer program; (4) developing and evaluating low-literacy direct mail messages targeted to mothers of young children; (5) assessing the effectiveness of continuation school classroom-based nutrition education; (6) using alternative approaches to reach isolated minority populations, such as extensive community-based cooking demonstrations; and (7) measuring of the success of a seniors-focused, four-stage program with counseling, demonstrations, and lectures.

2. Cooperative Extension System

a. General

One of the specific nutrition education programs conducted by the Cooperative Extension System is the Expanded Food and Nutrition Education Program (EFNEP). This program reaches low-income families with young children to help them acquire the knowledge, skills, attitudes, and changed behavior necessary for nutritionally sound diets and to contribute to their personal development. The long-term (6 month), intensive education provided by EFNEP helps families gain the knowledge and the skills and adopt the behaviors that lead to a healthier diet. EFNEP helps the families make significant improvements in their diets and spend less money on food. Food stamps are more likely to last until the end of the month, and commodity foods are used wisely. Many program participants also make other significant lifestyle changes, such as going back to school, getting a job, or reducing their intake of alcohol.

EFNEP operates in all 50 States and in American Samoa, Guam, Micronesia, Northern Marianas, Puerto Rico, and the Virgin Islands but reaches only a fraction of the eligible audience. Extension professionals train and supervise paraprofessionals and volunteers who teach food and nutrition information and skills to limited resource families and youth.

In fiscal year 1993, 204,366 families and 456,993 youth were reached through direct teaching contacts by EFNEP. Approximately 721,412 family members were indirectly reached through the adult participant.

Almost 1,800 full-time-equivalent paraprofessionals taught the adult and youth participants a comprehensive series of lessons on food and nutrition topics. Paraprofessionals are generally recruited from the target audience and are vital to the success of the program. They have experienced many of the problems that limited-resource families face and have developed special skills in coping with and solving these problems.

In addition, 48,621 volunteers worked 486,538 hours, equivalent to 233 full-time employees. At a minimum dollar value of \$5 per hour, the value of volunteers working in EFNEP in FY 1993 amounted to \$2,432,690. Volunteers

provided assistance in instructional roles, assisted the paraprofessionals with food demonstrations, helped with language barriers, and encouraged graduated participants to continue their learning and to become involved in other Extension programs. Volunteers also served on advisory committees, recruited families, and provided clerical help, babysitting, transportation, equipment, emergency food, and financial help.

All States reported cooperation with other agencies and private groups in order to implement the program in a more efficient manner. Most States have established referral systems with other Federal food assistance programs, such as the Supplemental Food Program for Women, Infants, and Children (WIC), and food stamps. Other collaboration with public and private groups includes Indian reservations, Headstart, schools, foster care, boys and girls clubs, commodity foods, State departments of education, health departments, battered women's groups, single parents' groups, YMCA, YWCA, Chicanos Por la Causa, adult basic education, Salvation Army, teen parent programs, Independent Living Skills programs, food pantries, and latchkey programs (after school programs). Many persons are recruited from these programs into EFNEP, and many persons are referred to these programs or are made aware of these programs by EFNEP.

b. Program Delivery and Impact

EFNEP participants receive a series of lessons on food safety, choosing healthy foods, meal planning, food purchasing, storage, preparation, and sanitation. While they're learning practical knowledge and skills, participants build self-esteem. Through EFNEP, participants learn self-worth—that they have something to offer their families and society.

The delivery of EFNEP youth programs takes various forms. EFNEP provides education at schools as an enrichment of the curriculum, in after-school care programs, through educational displays at fairs by 4-H EFNEP clubs, 4-H EFNEP day camps, and 4-H residential camps, community centers, neighborhood groups, and home gardening workshops. In addition to lessons on nutrition, food preparation and food safety, youth topics may also include fitness, avoidance of substance abuse, and home safety for latchkey children.

States gave more attention to the number of hours of instruction and the time period for enrollment. States mentioned timeframes of 3-6 months or less than 12 months. Of all graduating homemakers in 1993, 87 percent graduated in less than 12 months. States also reported an increase in graduation rate and increased workloads per full-time-equivalent paraprofessional. An EFNEP family participant completes between 12 and 20 lessons in a standard curriculum before graduation from the program.

A variety of methods were used to monitor improvement in diets, nutrition knowledge, food behavior practices, and (in a few cases) health indices of homemakers and youth. Methods included surveys I and II from the Eating Right Is Basic (ERIB2) curriculum, computer dietary analysis, counting servings from the food groups, and birthweights of infants born to EFNEP mothers.

Upon entry into EFNEP, a 24-hour food recall disclosed that only 51 percent of homemakers in a sample group had a diet with 1 or more servings of each of 4 food groups. Only 7 percent of the homemakers in the sample group had a diet that met the minimum recommended number of servings from each food group—two or more servings of milk and meat and four or more servings of vegetables/fruit and bread/cereals. Upon graduation, 83 percent of the homemakers in a sample group had a diet with one or more servings of each of the food groups, and 35 percent of the sample were eating the minimum recommended number of servings from each of four food groups.

c. Program Highlights

• Prenatal Care

Many States specifically target pregnant teens and adults at risk of having babies with low birthweight. The education is aimed at improving their prenatal and postpartum diets and, therefore, decrease the incidence of low-birthweight babies, increase healthy births, and improve infant nutrition. The risk of having low-birthweight babies is higher for women who are poor, black, younger than age 17, have little or no prenatal care, have inadequate diets, and gain less than 20 pounds during pregnancy. Nationwide, the percentage of babies born at low birthweight is increasing, from 6.7 percent in 1985 to 7.0 percent in 1990. Each year more than a quarter million infants are born at low birthweight (under 5 pounds 8 ounces). Low birthweight is strongly associated with infant deaths that occur in the neonatal period or first month of life. Inadequate nutrition among pregnant women may account for as much as 65 percent of babies born with low birthweight.

In the past 4 years, many States emphasized working with low-income pregnant and parenting teens and adults at risk of low-birthweight infants to help improve their prenatal and postpartum diets. Programs such as "Have a Healthy Baby" in Indiana, "Great Beginnings" in New Hampshire, and "Teenage Mothers" in Georgia were developed and are being implemented. Initial evaluation data are showing improvements in birthweights of babies and improved health practices of mothers. Indiana reported that of the 1,244 women in their program who delivered, 97.9 percent (1,218) had babies of normal birthweight. New Hampshire's program is showing an 85-percent increase in the participants' knowledge of nutrition issues specific to pregnant and parenting teens, and 90 percent of the participants showed intention to change one or more behaviors. In

Georgia, pre- and posttest scores showed that participants' knowledge of food and nutrition increased significantly. The average weight gain during pregnancy was 29 pounds and 84 percent of the babies were full term. The total weight gain was significantly related to birthweight. The average birthweight for babies of the 131 participants was 6.6 pounds.

Alabama reported that one-third of EFNEP adults and almost one-fifth of EFNEP youth were reached through Today's Mom, a group program for limited-resource pregnant women and teens. One-half of the 4,137 participants were teenagers. In a sample group of 789, an average birthweight of 7 pounds 2 ounces was found. Mothers ranged in age from 11 to 39 years. An average prenatal weight gain of 30 pounds was self-reported by the mothers. Only 9 percent of the infants born were of low birthweight, and 56 percent of those were born to teenagers.

Kentucky has developed a program, Partner Assisted Learning, for pregnant teens and adult women, most of whom are low income. EFNEP is working with WIC, local health departments, schools, young parents program from the University of Kentucky's Medical Center, best start breastfeeding program, Planned Parenthood, March of Dimes Babies, and others to focus on the importance of good nutrition during pregnancy. Preliminary data on a sample group show the percentage of babies born at low birthweight (6.4 percent) was below the State average (8.5 percent).

Mississippi Cooperative Extension, in partnership with the Mississippi State Department of Health and Freedom from Hunger Foundation, established the partners for improved nutrition and health program. The primary aim is to bring about local self-help activities leading to substantial improvements in the nutrition and health of low-income residents and to establish and disseminate models for self-help nutrition and health improvements suitable for replication in other parts of the rural South. One model, "Partners for Life," links EFNEP and WIC and delivers lessons on planning balanced diets, food preparation using WIC foods, budgeting, self-esteem, decision-making, and infant feeding. This program also acquaints participants with the availability of existing community nutrition programs, health care, and social services. The overall goal of Partners for Life is to reduce the numerous risks associated with low-birthweight infants and decrease the incidence of infant mortality.

d. Capturing Future Impacts

To improve the evaluation of EFNEP, a new evaluation/reporting system was developed that will capture the impacts of the program in a more descriptive manner. The system will identify how many pregnant and lactating women and adolescents are participating and the types of

public assistance they are receiving. It will also analyze the diets at entry to and exit from the program for conformance to the Food Guide Pyramid. It will look at participants' intake of key nutrients (protein, iron, calcium, vitamins A, C, and B₆) and fiber and the percent of calories from protein, fat, carbohydrate, and alcohol. The system will provide a diagnostic report for the participant, listing individual intake and comparing it to recommended levels. This report will be an effective teaching tool to help participants see how to modify their food selection for a healthier diet. Additional components of the system will capture information about behavior changes of participants, youth enrollment, and interagency cooperation. The system is designed primarily to meet the needs at the local level to increase the efficiency and effectiveness of EFNEP, but it will also yield a wealth of information about the positive impacts nationwide. The first phase of this system was completed in 1992 and final implementation occurred in the fall 1993.

e. Link Between ES and the ARS Children's Nutrition Research Center

Partnerships Can Be Effective—The Cooperative Extension System (CES) is a nationwide educational network that links research, science, and technology to the needs of people where they live and work. Its purpose is practical education for dealing with issues critical to the nation's future. Extension education combines the expertise and resources of Federal, State, and local governments. CES has the reputation of being a reliable and impartial source of research-based educational and information programming. In addition, CES has a demonstrated record of using skills and abilities to form alliances with other organizations to enhance the outreach and resources for projects addressing issues such as this.

In March 1993, a unique partnership was formed between ARS and the Children's Nutrition Research Center at Baylor College of Medicine in Houston. The purpose is to facilitate the interface between nutrition research and nutrition education and to provide leadership for educational efforts related to maternal and child health. The partnership disseminates the latest research to Extension educators in all 50 States and the U.S. territories, so their teaching in local communities can reflect the best knowledge available for positive pregnancy outcomes. ES is linking scientists and their findings on issues in maternal and infant nutrition (prenatal, adolescent pregnancies) with its network of educators. Families with limited resources are a special focus. A goal is to bring their special problems to the attention of researchers.

Progress to Date. A veteran Extension educator with extensive experience in reaching and teaching pregnant adolescents and adults was selected and located at Children's Nutrition Research Center. She has begun

establishing contacts and relationships with scientists and educators within the medical and research communities. Links are also being formed with other Federal agencies, universities, and organizations that focus on maternal and child health. An education and research needs assessment is being conducted of all 50 States and territories, with an emphasis on issues involving culturally diverse and limited-resource populations.

Future Plans. Careful study of the results of the needs assessment will provide a focus for addressing issues across the country. The development of educational materials to meet community needs, as well as of target-specific groups, could become a priority. Other significant outcomes would be identifying staff development and training needs for those who teach in local communities, both rural and urban. Future research needs would be identified based upon feedback from Extension locations.

f. ES/WIC Nutrition Education Initiative

Pregnant women, nursing mothers, mothers with young children, and children from birth to 5 years of age have special nutritional needs. Those with limited incomes are at increased risk for developing nutrition and health-related problems. Extension Service and FNS are collaborating to develop nutrition education programs that target these populations. CES nutrition educators will plan and conduct nutrition education programs with families enrolled in WIC.

The ES project to provide intensive nutrition education to WIC clientele received \$3,530,000 in new funds for FY 1993. The CES partners at the 1862 land-grant colleges and universities had the opportunity to develop plans of work (for \$30,000) and responses to a request for applications (up to \$100,000) for implementation of this initiative. CES institutions were required to redirect funds or secure additional resources that equaled at least one-half the amount received in Federal funds. The project proposals were reviewed by an interagency team for conformance with the guidelines.

Plans of work were received and approved for 55 States and territories, and 31 responses to the request for applications were received. There was an impressive variety in the proposals, with broad geographic representation and different audiences including pregnant adolescents and women, lactating women, infants, and preschoolers. Several different delivery modes were identified, including interactive computer, distance learning, videos, mobile van, and interactive CD, as well as classes and one-on-one instruction. Ethnic origins cited included Vietnamese and other Southeast Asians, Hispanic, Haitian, Pacific Islander, Native-American, and African-American. Sufficient money was available to fund one-half of the projects; 17 projects were selected.

To facilitate a strong evaluation component for this initiative, ES and FNS are working with ERS. In July 1993, a meeting with the project directors from the 17 competitive projects was held. The focus was how to assure the greatest commonality in evaluation data to be collected. The majority of the project directors decided to use the EFNEP evaluation/reporting system to gather the demographic, nutritional, and food behavior change impacts. This system allows the creation of separate data directories to keep information for different projects separate, thus expanding its usefulness. A subcommittee of project directors was formed to design a data collection instrument to measure breastfeeding initiation and duration.

g. Adoption of Model Programs in Maternal and Infant Nutrition Education

A new activity was an evaluation study that is looking at the adoption and diffusion of model programs across the country. Researchers are investigating what factors help to facilitate the use of an infant and maternal nutrition education program in a location other than where it was first developed, as well as the barriers to its use. The objective is to find out how to maximize the use of effective programs and build more effective curricula to meet the varied target audiences. This study is being conducted by Pennsylvania State University under a cooperative agreement with ES.

h. Extension Service Strategic Plan for Nutrition, Diet and Health Base Programs

In 1993, ES developed a strategic plan for nutrition, diet, and health base programs in CES. The plan proposed a common vision for nutrition education and suggested activities to realize that vision. The plan will guide the CES nutrition, diet, and health base program and can serve as a model for State, territorial, and local nutrition, diet, and health strategic planning.

i. The Nutrition Impact Indicator Project of the Cooperative Extension System

Although it is recognized that families and individuals across the United States receive benefits from CES diet, nutrition, and health programs, Extension educators recognized a need for national documentation of program effectiveness and for centralized data collection. The goal of the nutrition impact indicator project is to supply aggregative/quantifiable data from local and State CES nutrition, diet, and health programs to the Extension Service for evaluation of national program impact. To facilitate data collection, the project has focused on the development and use of impact indicators that examine knowledge and behavior of program participants consistent with recommendations of the *Dietary Guidelines for Americans*. Using these impact indicators, project members developed survey questionnaires that can be administered at the local level to

adult audiences who participate in CES diet, nutrition, and health programs. The questionnaires were pilot-tested in five states, and revised questionnaires were then pilot-tested.

j. National Extension Initiatives with Nutrition Components

CES identifies key high priority national issues that receive intensive attention for a limited period of time. One of these initiatives is the plight of young children, which focuses on limited-resource children from prenatal to age 5 and works with the families and communities where these children reside. The initiative is multidisciplinary and addresses many critical needs through programs in nutrition and health, money management, and parenting. States are beginning to work on programs to meet the many needs of this audience.

In late 1992, decisions for health became a national initiative. Regional in-service training workshops were conducted for State coordinators and were funded by the Office of Rural Health Policy, HHS, the Farm Foundation, and the regional rural development centers. A teaching packet on health care reform, including a tabloid for consumers' use in comparing the major health care reform proposals, was made available to all States in paper and electronic form. The objective is for citizens to make informed decisions related to health care reform and to make these known to elected officials.

A satellite staff development training session on October 20, 1993 was downlinked in 44 States at 400 locations. Health professionals, consumers, and elected officials participated in this interactive session. In November, a Building Partnerships for Rural Health Workshop was held in the Southern Region. State teams that participated were composed of 1862 and 1890 Extension educators, staffs of the State offices of rural health, public health departments, and area health education centers. One goal is for families and individuals to adopt healthy lifestyles by reducing high-risk behaviors and assuming responsibility for personal health decisions. Healthy People 2000: Objectives for the Nation forms the suggested action plan for this effort. Local communities are encouraged to convene strategic planning groups to develop an action plan that addresses the objectives which are of greatest need in community. Nutrition is addressed in many of the 22 objectives.

There is no Federal funding to support either of these initiatives, although funds were requested in fiscal year 1994 under the Youth and Families at Risk category to support the Plight of Young Children.

k. Ongoing Food Safety and Quality Programs in the Cooperative Extension System

• National Initiative for Food Safety Education

Through the Food Safety & Quality Initiative, CES is working to improve the ability of food producers, processors, distributors, retailers, the food service industry, and consumers to make informed, responsible decisions related to food safety and quality issues and practices. Target audiences are determined by States and counties based on their needs. The educational objectives for these clientele in Extension food safety and quality programs are

- Adoption of recommended food handling and preparation practices to reduce the risk of foodborne illness.
- Improvement of practices and processes that promote the production and protection of a food supply with minimal risk from environmental contaminants, including bacteria and naturally occurring toxins, and from drugs and chemical residues.
- Increased understanding and application of total quality management practices, including Hazard Analysis Critical Control Points (HACCP) and quality assurance to agricultural/aquatic production and food processing, preparation, and service operations.
- Improved understanding of risks and responsible practices in relation to food and health through increased knowledge in six areas.

Interdisciplinary food safety teams and programs at regional, State, and district or county levels are in operation in most of the country. Regional food safety task forces have been organizing and defining their objectives and projects. The Extension rapid response system for notifying States of time-sensitive information is utilized frequently for major alerts to media attention on food safety issues, such as the foodborne illness outbreak with *E. coli*, and for release of important USDA food safety information, such as safe handling labels for meat and new pesticide policies. This system allows States to be prepared with educational messages for public inquiries and to take advantage of opportunities for education.

The FY 1993 Congressional appropriations for ES contained \$1.5 million to fund the development of food safety and quality programs and to update and improve the food animal residue avoidance data bank. Thirty model programs addressing six priority areas were funded each year in FY 1991-92. In FY 1993, more emphasis was placed on transfer and dissemination of model programs, with evaluation of their effectiveness. New programs were funded only if they addressed an identified gap in available programs. The projects concentrated resources and produced up-to-

date curricula or educational methods in (1) food handler training, especially for those who serve high-risk individuals and who have limited resources for training; (2) risk education with youth and adults; (3) enhanced utilization of the Food Animal Residue Avoidance Data Bank in educational programs; and (4) model and total quality management programs in agricultural production and food processing and retailing.

These and other programs also resulted in coalition-building and shared programming with other agencies and organizations. Cooperators typically include State and local departments of health, agriculture, human resources, education and human services; commodity and trade associations; medical schools and associations; and industry. In addition, they may include regional or field staff of other Federal agencies where geographically possible. The cooperation varies from serving on task forces to joint training and educational programs. The most frequently mentioned benefits are improved coordination and communications.

- Food Handler Education in Virginia

The State of Virginia conducts a cooperative, voluntary food service manager certification educational program through teaching teams from CES and the State's Department of health. After 2 years, approximately 1,000 managers are being certified per year and over 54 Extension home economists were trained to conduct the certification courses with a State or district sanitarian. Over 90 percent of respondents to a questionnaire indicated they communicate the information to other employees in their operations and incorporate new practices as a result of the training. The course is approximately 18 hours of training based on the ServSafe(R) program of the Educational Foundation of the National Restaurant Association.

- Tennessee Responds to Foodborne Illness Outbreak

An outbreak of food-related staphylococcus infection was attributed to a food service establishment in Loudon County, TN. In response, the county Extension home economist provided seminars on foodborne illness and safe food handling that reached 7 restaurant establishments in the county and 22 staff. As a result, continuing seminars are being planned at 6-month intervals.

- Tennessee Extension Staff Educates Prison Food Service Employees

The Extension home economist and two paraprofessionals conducted an on-site 3-day educational program on nutrition and food safety in food service for supervisors of two local prisons. The program included demonstration tours of all cafeterias at both prison sites. Future training was scheduled and officials of the prisons were satisfied that real needs were met.

- Southern Maine Food Forum Established To Focus on the Food System

Five counties established the Southern Maine Food Forum in 1993, modeled after the northeast network programming out of Cornell and Pennsylvania State Universities. Educators from the five counties are providing opportunities for key players in the food system to focus on issues of concern and have dialogues among groups affected. The group clarified three priority issues facing the southern Maine food system, developed desirable outcomes and strategies for reaching them, and will be publishing a food digest to facilitate communications. Southern Maine will be focusing on consumer education, food safety, and expanding local markets.

- Missouri Tackles Early Food Safety Education

Missouri Extension completed five lessons on food safety education for preschoolers. They include a 3- to 5-minute video vignette, background information and lesson plans for teachers, learning activities and experiments for children, and newsletters for parents. Each video vignette featured puppets who address food safety topics, including handwashing, proper food storage, and spreading germs. The materials were pilot-tested through Headstart, parents as teachers, and the public school system with children from 4 through 7 years of age. Teachers indicated that children in the early elementary school classes showed the greatest interest in the activities and were receptive to the information.

3. Agricultural Marketing Service Programs

- Fresh Produce Purchased for School Lunch Program

The expanded distribution of fresh fruits and vegetables in the school lunch program is being explored by AMS. For the 1993 school year, AMS bought 8 million pounds of fresh grapefruit, oranges, tomatoes, and potatoes (\$1.7 million), in addition to the routine purchase of fresh apples and pears, which totaled 8.8 million pounds (\$2.5 million).

- Poultry Adds Variety to School Menus

Frozen, cooked, and breaded chicken patties were successfully test-marketed in schools during 1993 by AMS. Additional purchases were also made of low-fat turkey burgers and fully cooked, individually frozen, diced chicken meat, products test-marketed in 1992.

- Low-Fat Beef Patty Formulas Tested for Schools

Eleven companies submitted 15 new formulations of low-fat beef patties to AMS for possible future school lunch program purchases. The products were tested by five cooperating land-grant universities and the ARS meat

science research laboratories. When analysis of the data is complete, products showing the most promise may be purchased for testing in the schools.

- Pork Patties Added to School Lunch Offerings

Cooked, rib-shaped pork patties with barbecue seasoning, prepared according to an AMS specification, were tested in the spring 1993 and will be offered to schools in the future under a State option contract program. In recent years, schools have used reprocessing contracts to convert much of the donated ground pork they received into pork patties. The program should reduce costs to the schools since the costs of reprocessing will be included in the finished product costs and the schools will pay only the costs above the basic commodity cost.

- Fat-Modified Dairy Products for Schools

Specifications for a reduced-fat Cheddar cheese and a margarine-butter blend were developed by AMS at the request of Consolidated Farm Service Agency, the purchaser of dairy products for FNS and the school lunch program. Traditional Cheddar cheese has a 30.5 percent total fat content, whereas the reduced-fat Cheddar cheese will contain between a quarter to a third less fat. The margarine-butter blend will contain 60 percent vegetable oil and 40 percent milkfat. One contract was awarded to a processor for the manufacture of the reduced-fat Cheddar cheese.

- "How to Buy ..." Series Revised

Five brochures from the AMS "How to Buy ..." series were revised to include dietary guidance information. They included the booklets about fresh vegetables, fresh fruits, canned and frozen vegetables, canned and frozen fruits, and potatoes. The series originated in 1967 as part of an AMS public information campaign to inform consumers about USDA's food grades and grading services. It had been unavailable for distribution since the early 1980's, although the agency continues to receive requests for it.

4. National Agricultural Library (NAL) Programs

The Food and Nutrition Information Center (FNIC) is staffed by nutritionists, registered dietitians, and information specialists. It serves all persons seeking food and human nutrition information and educational materials. In fiscal year 1993, FNIC answered over 6,500 in-depth reference questions, responded to an additional 9,300 requests for publications, and worked with several hundred visitors to the center.

a. Interagency and Trust Fund Cooperative Agreements

FNS supported NAL again with an \$110,000 interagency agreement that provides FNS program professionals with extensive information services, including free document delivery services for journal articles and educational materials, and unlimited reference assistance.

FNIC continued work with the University of Mississippi National Food Service Management Institute to provide access to information and document delivery services to child nutrition program personnel concerning nutrition and food service management. NAL receives \$43,000 annually from the institute for services. FNIC and the institute are linked through an extension to a toll-free number located at the University of Mississippi. Callers are connected to an Institute nutritionist located at FNIC in Beltsville, MD.

b. FDA/USDA Food Labeling Education Information Center

Since September 1992, the FDA/USDA Food Labeling Education Information Center has helped organizations involved in educating the public about the new food label share information and funds, avoid duplication of effort, and communicate consistent messages to the public. A unique service of the center is its ability to foster partnerships and networks among organizations and to facilitate working agreements between groups with common goals. Another important function is to identify gaps in existing labeling education materials. In this way, resources for new labeling efforts can be used to develop needed materials, for example, culturally or language specific, rather than duplicating what is already available. FSIS and FDA provide partial funding for the center.

c. New Bibliographies/Information

The following bibliographies and resource lists were published in fiscal year 1993: *Nutrition Education Printed Materials and Audiovisuals: Grades Preschool - 6*, *Nutrition Education Printed Materials and Audiovisuals: Grades 7-12*, *Nutrition and AIDS Addendum*, *Adult/Patient Audiovisuals*, *Audiovisuals About Basic Nutrition*, *Audiovisuals About Low-Fat, Low-Cholesterol Eating for a Healthy Heart*, *Audiovisuals About Weight Control*, *Audiovisuals for Nutrition Education About Diabetes*, *Electronic Sources of Food and Nutrition Information*, *Food Service Management Audiovisuals*, *Food Service Management Videotapes*, *Models & Replicas in the FNIC Collection*, *Selected Audiotapes in the FNIC Collection*, *Selected Self-Improvement and Management Audiotapes in the FNIC Collection*, and *Sources of Free or Low-Cost Food and Nutrition Materials*.

FNIC publications are available on floppy disks and through several electronic access points: NAL's electronic bulletin board, Agricultural Library Forum (ALF); the Internet on an FNIC gopher server; The Pennsylvania State University's PENPages' International Food and Nutrition Data Base; and the HNIS electronic bulletin board, Nutrient Data Bank Bulletin Board.

d. National Microcomputer Software Demonstration Center

The National Software Demonstration Center is an FNIC service providing free on-site use of nutrition software to educators, health professionals, consumers, software developers, and the general public. On-site assistance is provided by a nutritionist. Public and private sector software producers donated over 220 software programs or demonstration disks and CD-ROM's to FNIC. Subject coverage includes dietary analysis or diet planning, food service and planning management, food industry, nutrition education, and recipes. Visitors throughout the world used the center in 1993.

e. Food Irradiation Research Materials

NAL received \$50,000 in ARS 1993 evaluation study funds to assist with the evaluation and processing of thousands of pages of food irradiation research reports from the 1950's and 1960's. The documents will be digitized and made accessible in full text via CD-ROM.

FNIC staff are working with food irradiation experts and information systems experts to evaluate thousands of pages of research documents. The research is primarily unpublished and difficult-to-access materials that have not been readily available to the world research community.

The first of a series of food irradiation CD-ROM's was reissued in 1993. The CD-ROM contains 5,600 pages of U.S. Army Quartermaster Corp research reports.

C. Nutrition Education and Information Highlights

1. Implementation of the Dietary Guidelines for Americans in the Child Nutrition Programs

To gather information on how the national school lunch and school breakfast programs could conform to recommendations of the *Dietary Guidelines for Americans* and scientific knowledge about the link between diet and health, the Department solicited comments through public hearings and written comments. In a notice, published in the Federal Register on September 13, 1993, the Department announced a series of four public hearings. Anyone could register to speak at any of the hearings, and those unable to testify were invited to submit written comments. The notice identified the following four questions as focus areas:

1. What are the health consequences of children's current dietary patterns?
2. How can the Dietary Guidelines for Americans be used to bring about measurable nutritional improvements in schools meals and in children's diets?
3. What are the opportunities and obstacles in meeting current nutrition recommendations in school meal programs?
4. What actions can USDA, parents, school food service, food industry, and other public and private organizations take to encourage the implementation of current nutrition recommendations in local schools?

The hearings were held in Atlanta on October 13, 1993; in Los Angeles on October 27; in Flint, MI on November 12; and in Washington, DC on December 7. USDA Assistant Secretary Ellen Haas chaired each hearing. Joining her were officials from the Department of Education and DHHS—USDA's Federal partners in this effort. A total of 363 witnesses testified at the hearings and an additional 2,013 written comments were received.

The majority of commenters representing a broad range of background and experiences called for improvements to school meals. Of the 2,376 commenters 21 percent were medical professionals, nutritionists, dietitians, or representatives of public health, nutrition or food organizations; 21 percent were from the general public; 21 percent were parents and students; 16 percent were school food service personnel, representatives of school food service organizations, or representatives from State education/child nutrition agencies.

The following significant themes emerged: (1) the need to improve school meals in order to improve the health of children; (2) the need for school meals to reflect current nutrition recommendations, specifically reductions in fat and saturated fat as recommended in the dietary guidelines; (3) the importance of an integrated nutrition education program that involves students, parents, teachers, and school food service personnel; (4) the need to revise current commodity programs to provide schools with more nutritious foods; and (5) the need to incorporate nutritional improvements while at the same time improving the appeal of meals offered to ensure that nutritious meals are consumed.

All comments are being carefully weighed as the Department considers policy options and opportunities to bring school meals into compliance with the guidelines.

The following are other highlights in 1993 relating to improving the nutritional quality of school meals:

- Nutrient Standard Menu Planning Method for the National School Lunch and School Breakfast Programs

FNS is undertaking a shift from a food-based meal pattern to a nutritional analysis approach to menu planning. This approach is a menu planning system that is based on the analysis of nutrients and will require school meals, averaged over a menu cycle, to meet specific nutritional standards for a set of key nutrients, rather than a specific set of food categories.

On April 1, 1993, USDA gave public notice in the Federal Register of the National School Lunch Program and School Breakfast Program: Nutrient Standard Menu Planning (NSMP) Demonstration Project. This project is to refine the implementation of NSMP as a way to ensure achieving the nutritional quality of that are consistent with the *Dietary Guidelines for Americans* and the recommended dietary allowances, as well as the recommended energy intakes for children.

Participation in the project was voluntary and selective. Thirty-four school food authorities were selected to participate. These school districts represent 25 States in 7 FNS regions. The project is scheduled for 3 years and will be completed by 1997.

Specifications were developed for school food service software. This software will support an accurate nutrient analysis of the school meals and use of the national nutrient data base for child nutrition programs. The data base is being developed by HNIS. The software specifications were developed by FNS and are available to private software developers to produce and market to local schools.

- Technical Assistance Projects

A cooperative agreement was signed with the Hotel, Restaurant, and Recreational Management School of Pennsylvania State University for the development of approximately 50 new recipes for the national school lunch and school breakfast programs. The work includes development, testing, standardization, and nutrient analysis. The recipes are written for 50 and 100 servings and emphasize variety and the incorporation of new cultural and ethnic foods.

Recipes are being field-tested in schools throughout the nation.

- Nutrition Guidance for the Child Nutrition Programs

Building for the Future, Nutrition Guidance for the Child Nutrition Programs was translated into Spanish and disseminated in 1994 to local program cooperators in the

national school lunch program and child and adult care food programs. This is the first nutrition/food service publication disseminated to child nutrition program cooperators. A Spanish translation of *Making Healthy Food Choices* was developed and will be distributed to child care program centers and to family day care providers next year.

2. Nutrition Labeling Regulation

FSIS published a final rule in the Federal Register on January 6, 1993, for the nutrition labeling of meat and poultry products. The rule permits voluntary labeling on single-ingredient, raw meat and poultry products and establishes mandatory nutrition labeling for most all other meat and poultry products, with certain exceptions. The effective date was July 6, 1994.

These regulations incorporate recommendations from several nutrition labeling endeavors, including the National Academy of Sciences Report, which recommended that FSIS and FDA mandate nutrition labeling for most regulated packaged food products, and from extensive public comment. FSIS and FDA have worked together since 1989 to develop and publish similar regulations for the nutrition labeling of food products. FSIS's final regulation parallels FDA's to the extent possible; there are differences in the types of foods regulated by each agency.

Since the publication of the final rule, FSIS also published corrections and technical amendments to the final rule in 1993. "Nutrition Labeling of Meat and Poultry Products; Corrections," August 18, 1993, addresses inconsistencies in the regulations, improves accuracy, and corrects unintended technical consequences. "Nutrition Labeling of Meat and Poultry Products; Technical Amendments," September 10, 1993, adopted changes in cross-referenced sections associated with FDA's corrections, published April 1 and 2, 1993, and FDA's technical amendments to its final rule on nutrition labeling, published August 18, 1993. These provisions relate to metric quantities, servings per container, reference amounts, nutrient content claims, saturated fat-free claims, foods for infants and children under 4 years of age, and packages with less than 12 square inches of space. FSIS also corrected the terminology for extra lean ground beef.

In addition to proposing regulations for nutrition labeling, FSIS solicited comments on the appropriateness and usefulness of the term "healthy" and derivatives of the term, such as "healthful" or "healthier" by publishing a proposed rule on January 6, 1993, for the labeling of meat and poultry products. The proposed criteria would be defined in reference to total fat, saturated fat, cholesterol, and sodium. FSIS continued progress toward publishing proposed regulations for the use of health claims on meat and poultry products to parallel FDA's regulation of health claims.

- Issues Paper Concerning Nutrition Labeling

ERS worked with FSIS in estimating the costs to industry associated with the mandatory nutrition labeling for processed meat and poultry products. To brief the new administrator, ERS prepared an issues paper describing the current nutrition labeling situation, the expected health benefits and costs to industry, the steps taken to minimize these costs, and areas requiring additional decision-making in the near future. For further information, see *Food Sector Regulation: Nutrition Labeling* (ERS, AIB-664-46, June 1993).

- Consumer Education on Nutrition Labeling

FSIS and FDA are developing strategies to assist consumers in understanding how to read the new label and to use it to choose a healthful diet. The agencies are coordinating a joint public- and private-sector education campaign, "National Exchange for Food Labeling Education" to help educate the American public about nutrition labeling. The campaign includes representatives from government, industry, and health, consumer, and educational groups. The campaign has four main components: information exchange, research, media relations, and development of educational materials and programs. The campaign will help plan and coordinate activities of organizations conducting food label education and encourage education programs targeted to special populations, such as ethnic minorities, literacy-challenged persons, the elderly, and persons with special dietary needs.

A key feature of the campaign is the Food Labeling Education Information Center of USDA's National Agricultural Library. The center is designed to encourage public- and private-sector organizations to exchange information about their food labeling education activities and make it easier for such organizations to initiate and find partners for label education programs. The center operates an electronic bulletin board on food labeling education, publishes a periodic update of educational activities, answers inquiries, and refers callers to organizations and food labeling experts.

The campaign sponsored a video teleconference April 1, 1993, and a community-wide meeting of professionals on nutrition labeling in June 1993. Additionally, FSIS devoted a special issue of *Food News for Consumers* to nutrition labeling issues.

The Nutrition Labeling and Education Act requires the Secretary of Health and Human Services to carry out activities that educate consumers about (1) the availability of nutrition information in the labeling of foods, and (2) the importance of that information in maintaining healthy dietary practices.

General Labeling Education Guidelines are designed to

- Help consumers understand that their diet does affect their health and is connected to disease relationships. Show them how to use the claims and nutrition facts panel to understand the nutrition profile of a product, that is, how to limit some intake of nutrients (fat, sodium, and cholesterol) and increase others (fiber and calcium).
- Teach the label in sections—not all at once. Start with information on the front of the food package (that is, claims which attract consumers' attention).
- Minimize complex and lengthy explanations. Consumers can learn to use the food label without having to learn nutrition concepts, memorize definitions, or perform mathematical calculations.
- Limit advice and message. Convey no more than two or three simplified messages on behavior recommendations.

The nutrition education division of HNIS worked closely with FSIS and FDA on research and the development of educational materials and programs related to the food label. Helping consumers understand the consistency in nutrition-related information from the Federal Government is a focus. Research indicates that knowledge about nutrition and belief in the importance of following the principles for healthy eating are positively associated with label use. Educational materials for professionals and consumers are in development on how to use the food label in following the Food Guide Pyramid, which itself is an implementation of the *Dietary Guidelines for Americans* in daily food choices.

- Costs Associated with Nutrition Labeling

ERS and FSIS jointly estimated the costs associated with USDA regulations for mandatory nutrition labeling on meat and poultry products for retail sale. Their analysis is reported in *Final Regulatory Impact Analysis of Regulations for Nutrition Labeling of Meat and Poultry Products* (FSIS, December 1992).

A 20-year period was selected as the timeframe for estimating costs because many benefits ascribed to the new nutrition labeling regulations—such as reduced mortality from cancer and coronary heart disease—would not begin to accrue for some years. Following on a study conducted by the Research Triangle Institute, costs were visualized as (1) start-up costs (such as those from administrative decisions, initial analytical testing in the laboratory, printing of new labels, and loss of current label inventory) and (2) recurring costs (those of repeating analytical tests over the years).

Large cost estimates—primarily associated with analytical testing of nutrients in foods—and public comments led USDA to reconsider some initial decisions and make two changes from its proposed regulations: (1) food manufacturers may use recipe analysis and food composition data bases to support the information on the nutrition label and (2) small businesses are exempt from mandatory nutrition labeling.

Industry can save money by using established food composition data bases—for example, the HNIS Agriculture Handbook No. 8, *Composition of Foods: Raw, Processed, Prepared*—to support information on the nutrition label. Laboratory testing of nutrients in foods is expensive. Allowing manufacturers to use recipe analysis and data bases was estimated to reduce industry costs from \$140 million to \$229 million over 20 years, assuming that 30 percent of the products would carry nutrition labels based on such information and depending on whether the remaining 70 percent would undergo analytical retesting every 2 or 5 years.

Exempting small businesses from mandatory nutrition labeling was found to significantly reduce industry costs with little loss in benefits to consumers. The issue was how to minimize the inherent risk of failure that any small business faces, while maximizing the proportion of production providing nutrition information. Analysis revealed that most of the health benefits could be achieved if the relatively few products that account for most of total production provided nutrition labeling.

Most of the compliance costs would be borne by the large number of products that account for a relatively small portion of total production. Using scanner data and other information, researchers experimented with different cutoff points for exempting a business from mandatory nutrition labeling. They identified products below 100,000 pounds of annual production by firms with 500 or fewer employees as a cutoff point that would exempt an estimated 97 percent of the products produced by small businesses, while retaining nutrition labeling for approximately 95 percent of all grocery store sales. If the exemptions were to be phased in over 3 years, with a cutoff of 250,000 pounds the first year, 175,000 pounds the second year, and finally, 100,000 pounds the third year (and assuming 30 percent of the products would use recipe analysis to obtain the nutrient information for the label), total costs associated with mandatory labeling would be reduced from about \$562 million to about \$768 million over 20 years.

3. Breastfeeding Promotion Efforts

Breastfeeding promotion has become a major emphasis of the WIC program. In 1993, FNS provided technical assistance to assist WIC State and local agencies in implementing a final rule enhancing the WIC food package for

breastfeeding women to more effectively meet their nutrition needs and to support their decision to breastfeed.

FNS undertook several studies to provide information for evaluating the effectiveness of WIC breastfeeding promotion efforts.

- WIC nutrition education assessment study will investigate the process of providing nutrition education to participants and the impact of these services on participants', nutrition-related knowledge, attitudes, behavior, and satisfaction with services in selected sites. Nutrition education services include breastfeeding promotion and support services.
- The WIC infant feeding study will investigate infant feeding practices in a nationally representative sample of WIC participants. It will focus in particular on the circumstances and influences that shape maternal intention regarding feeding practices during the first year of life.
- The WIC dynamics study will determine the effects of rapid growth and other changes on local WIC agencies' service delivery. It will also examine the impact of increased participation on WIC's integration and coordination with local health care systems. It will identify activities related to breastfeeding promotion and support services provided to WIC participants.

FNS prepared a "statement of action" in response to a General Accounting Office report submitted to Congress on December 16, 1993, entitled "Breastfeeding: WIC's Efforts to Promote Breastfeeding Have Increased." This report was complimentary about the efforts of USDA and WIC State agencies to promote breastfeeding. The statement of action responded to the two recommendations GAO made. The first recommended that FNS work with WIC State directors to improve the dissemination of foreign-language breastfeeding education materials in the WIC program, either by publicizing and encouraging increased utilization of the Food and Nutrition Information Center or by other means. The Department developed a plan of action to carry out this recommendation. The second recommendation stated that the Secretaries of Agriculture and DHHS should work with State WIC directors and State health directors to develop written policies defining when breastfeeding is contraindicated. USDA concurred that written policies should be developed. However, because USDA believes that contraindications to breastfeeding is an emerging issue, DHHS is the appropriate Federal agency to take the lead in developing any written national policy. USDA will initiate efforts with DHHS on this endeavor.

The legislative history accompanying the fiscal year 1994 Agriculture Appropriations Act (P.L. 103-111), requests that USDA review the adequacy of WIC's statutory provisions on breastfeeding and report its findings and

recommendations to the appropriate congressional committees. The report provided general information on (1) USDA and the State efforts to promote breastfeeding; (2) USDA's efforts to obtain more information on WIC's effect on breastfeeding rates, and (3) the GAO report to Congress described above. The Department addresses four areas in the report that cover statutory provisions:

- Adequacy of the \$8 million set aside for breastfeeding promotion. The Department pointed out that States are voluntarily spending far beyond the \$8 million—about double that amount (\$16 million in fiscal year 1992). Therefore, mandating an increase is unnecessary.
- Using nutrition services and administration funds versus food funds for purchasing breastfeeding aids for use by WIC participants. The Department explored this issue at the request of the National Advisory Council on Maternal, Infant, and Fetal Nutrition and concluded that only nutrition services and administration funds should be used. The Council agreed. The Department recommends that Congress continue to mandate only the use of nutrition services and administration funds for this purpose.
- Breastfeeding campaign—need to identify funding sources. Although the Department received authority to accept donations from the private and public sector, such support may not be forthcoming. Therefore, further legislative initiatives may be needed to secure necessary funding.
- Need for mandatory breastfeeding data reporting from States. USDA supports enactment of legislation to require such data reporting. Current data on breastfeeding rates, incidence, and duration among WIC participants is not available.

The Department convened a meeting of the breastfeeding promotion consortium on May 18, 1993. Since June 1990, the Department has convened meetings of the consortium to exchange information and consider joint efforts to promote and support breastfeeding. Over 25 national organizations participated, including major health professional associations, advocacy organizations, and Federal agencies. In cooperation with the consortium, the Department is undertaking a breastfeeding promotion campaign to influence attitudes and to support coalition/infrastructure-building activities that will provide women with information and support services to enable them to successfully breastfeed.

The Department revised its publication "How WIC Helps," which includes information on why breastmilk is the best food for babies. The Department also began developing a WIC brochure in response to a congressional mandate accompanying the fiscal year 1994 Agriculture Appropriations Act (P.L. 103-111). The mandate requested that

women participating in the WIC program be counseled to reinforce important health messages they received through the program. These messages include the importance of continued breastfeeding.

4. 1890 Institution Capacity Building Grants Program—1993

This program serves as the crux of the USDA's high-priority initiative to advance the teaching and research capacity of the 1890 land-grant institutions and Tuskegee University. The program, administered by the CSRS Office of Higher Education Programs, is competitive in nature and provides support for teaching and research projects in targeted high-priority areas.

This year Tennessee State University was awarded \$191,206 for a teaching project entitled "Building Human Capital in Foods and Nutrition." This project is designed to enhance the teaching capacity within the department of home economics and the university by strengthening faculty, improving student enrollment, revitalizing the curriculum, and improving the resources for teaching foods and nutrition. The project will provide opportunities for students to develop scientific and professional competencies by participating in research projects, practicums, and co-op and mentoring programs. Faculty members will gain additional technological skills and competencies through the use of state-of-the-art instructional and tutorial computer aids for the nutrition laboratory.

Kentucky State University was awarded \$288,769 for a research project entitled "Calcium Metabolism and Bone Structure Impacted by Dieting and Body Weight Change." This project proposes to delineate the relationship between bone health and body weight reduction caused by varying degrees of dietary energy restriction and weight restoration. Research personnel, including a student apprentice at the university, will be trained in research techniques in calcium metabolism and bone health. Enhancements such as scientific expertise from the Western Human Nutrition Research Center and a state-of-the-art nutrition lab are expected to facilitate recruitment of students into food and agricultural sciences. Research information will also be provided to promote better nutritional health of the public and increase the capabilities of Kentucky State University to compete for competitive research grants.

IV. Funding Levels (1986-93)

The expenditures for human nutrition research, education, and information by USDA agencies in FY 1986-93 are summarized in table 2. The estimate for FY 1994 and the budget for FY 1994 are also included. The total amount of human nutrition research support increased 25 percent, from \$60.7 million in FY 1986 to \$75.9 million in FY 1993.

Table 2. U.S. Department of Agriculture, Human Nutrition Research, Monitoring and Education Support (FY1986-95) (\$ in Millions)

HUMAN NUTRITION RESEARCH AND MONITORING									
Fiscal Year									
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 actual	1993 actual	1994 actual
ARS (former HNNS functions)	37.8	40.6	44.3	45.7	47.9	49.6	49.9	49.7	50.7
CSRS	12.8	6.1	7.1	7.7	7.9	8.5	9.0	7.3	9.3 ¹
ERS	7.9	7.5	7.6	6.9	8.1	10.7	12.3	12.7	0.0
FNS	0.7	1.2	1.0	0.9	0.9	1.1	1.1	1.5	12.7
	1.5	0.5	0.5	0.6	2.8	2.3	3.8	4.7	1.5
TOTAL	60.7	55.9	60.5	61.8	67.6	72.2	76.1	75.9	74.7
HUMAN NUTRITION EDUCATION									
ES	73.5	73.5	75.0	75.0	74.6	77.2	77.7	80.9	82.7
ARS	0.7	0.7	1.2	1.1	1.1	1.4	1.3	1.2	1.8
FNS (FCS)	57.6	60.4	65.5	71.6	106.7	128.5	153.9	184.7	242.5
FSIS	0.4	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
NAL	0.5	0.4	0.5	0.7	0.7	0.8	0.7	0.7	0.0
TOTAL	132.7	135.1	142.3	148.6	183.2	208.0	233.7	267.6	327.9
TOTAL RESEARCH, MONITORING AND EDUCATION	193.4	191.0	202.8	210.4	250.8	280.2	309.8	343.5	369.8
									402.6

¹ Human Nutrition Information Service functions are in ARS for 1994; FY1995 funds are integrated.

During the same period, support for human nutrition education and information rose 103 percent, from \$132.1 to 267.6 million. The total support for human nutrition research education and information in FY 1993 was \$343.5 million, or 78 percent more than that expended in FY 1986.

Table 3 shows the amount of human nutrition research support within the Department for this period by subject area categories and agency. Over half of the human nutrition research effort was focused on determining nutrient requirements/health maintenance at all stages of life. About one-tenth of the effort related to the development of methods for measuring nutritional status and collecting food consumption information. Approximately one-sixth of the funds was used to measure the content and bioavailability of nutrients in foods. The funds shown in table 3 do not include those provided by the States or other sources and those used in conjunction with funds provided by CSRS.

Funds available for competitive research grants in human nutrition through the National Research Institute Competitive Grants Program (NRICGP) were \$3.80 million in FY 1993, the same as in 1992.

Table 4 presents a breakdown of human nutrition education and information expenditures and budgets by subject category for FY 1986-93.

A summary of actual expenditures and estimated support and of congressional appropriation are given in table 5 for the five human nutrition research centers and other ARS laboratories or centers for FY 1986-93. The net figure refers to funds to the location, while the gross amount includes overhead costs.

ARS operates the center at Tufts University in Boston as a Government-owned, contract-operated facility. It operates the Center at Baylor College of Medicine in Houston through a cooperative agreement.

Human nutrition research support at ARS regional research centers and other laboratories is shown in table 6. Studies supported help to ensure that problems and opportunities in human nutrition are considered in research directly related to the quality of the food supply.

Each year WIC State agencies must spend a minimum total for all States of \$8 million nationwide for breastfeeding promotion activities. These expenditures must be made from States' WIC administrative grants (or other sources) and do not constitute additional Federal appropriations.

V. Coordination and Advisory Mechanisms

A. Coordination Within the Federal Sector

- Interagency Board for Nutrition Monitoring and Related Research

The Interagency Board for Nutrition Monitoring and Related Research (IBNMRR) was co-chaired by the USDA Assistant Secretary for Food and Consumer Services and the DHHS Assistant Secretary for Health in 1993. The IBNMRR includes members from all Federal agencies that conduct nutrition monitoring or related research and are major users of nutrition monitoring data, and a liaison from the National Nutrition Monitoring Advisory Council. The board is responsible for enhancing the effectiveness and productivity of Federal nutrition monitoring efforts by improving planning, coordination, and communication among agencies. Working groups under the board address issues in survey comparability; Federal-State relations; information dissemination and exchange; and food composition data bases. Under the auspices of the board, HNIS produced the first National Nutrition Monitoring Chartbook in conjunction with DHHS. *Chartbook I: Selected Findings from the National Nutrition Monitoring and Related Research Program* presents recent data and trends from across the nutrition monitoring program in a graphic format with limited text and simple tables. During 1993, the board also produced the *Ten-Year Comprehensive Plan: First Year Progress, 1992 Executive Summary*.

- Ten-Year Plan Interagency Implementation Working Group

HNIS co-chairs with DHHS the 10-Year Plan Interagency Implementation Working Group, which includes staff from all involved agencies assigned to 10-year plan activities. The group met twice in 1993 to review strategies and implementation progress. Emphasis was placed on the value of interagency collaboration to pool resources to implement activities to meet common objectives. The implementation group produced an executive summary of 1992 progress; and over 500 copies of the 10-year plan and the 1992 summary of progress were disseminated.

- Federal-State Relations, Information Dissemination, and Exchange (STRIDE) Working Group

Federal STRIDE Working Group, co-chaired by HNIS and DHHS, is one of three working groups of the Interagency Board for Nutrition Monitoring and Related Research. Federal STRIDE develops, coordinates, and monitors procedures for improving communication with users of nutrition monitoring data and facilitates communication within the interagency board regarding member agency activities. The working group met three times in 1993 and

Table 3. USDA Nutrition Research and Monitoring Support (FY1986-95) (\$ in Millions)

	Fiscal Year									
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 actual	1993 actual	1994 actual	1995 estimate
1. Nutrient Requirements/ Health Maintenance										
CSRS	3.7	4.8	4.2	4.0	4.2	6.0	6.2	7.1	7.7	7.5
ARS	27.5	29.9	31.0	33.3	37.7	38.1	39.4	39.4	37.6	38.3
TOTAL	31.2	34.7	35.2	37.3	41.9	44.1	45.6	46.5	45.3	45.8
2. Nutritional Status/ Food Intake										
CSRS	2.4	1.4	1.8	1.3	2.4	2.5	3.4	3.4	3.5	3.3
ARS	3.1	3.9	3.9	4.0	2.5	3.3	4.5	4.1	7.1	14.0
(former HNIS functions)	9.9	3.2	3.9	4.8	4.9	5.4	5.2	5.1	8.5	0.0
FNS	—	—	—	0.1	—	—	—	—	—	—
TOTAL	15.4	8.5	9.6	10.2	9.8	11.2	13.1	12.6	19.1	17.3
3. Use of Food/Food Choices										
CSRS	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.8	0.6
ARS(former HNIS)+NAL	1.1	1.1	1.3	1.1	1.1	1.2	2.0	1.8	0.4	0.0
ERS	0.4	0.9	0.7	0.8	0.8	1.0	0.8	1.1	1.1	1.1
FNS	—	—	—	—	0.1	—	—	—	—	—
TOTAL	1.7	2.3	2.2	2.2	2.3	2.5	3.1	3.2	2.3	1.7
4. Nutrient Composition/ Bioavailability										
CSRS	1.6	1.0	1.4	1.2	1.2	1.8	2.4	1.6	1.2	1.2
ARS	7.2	6.8	9.4	8.4	7.7	8.2	6.0	6.2	6.0	8.2
(former HNIS functions)	1.8	1.8	1.9	1.8	1.9	1.9	1.8	0.4	0.4	0.0
TOTAL	10.6	9.6	12.7	11.4	10.8	11.9	10.2	8.2	7.6	9.4

—Continued

Table 3—Continued. USDA NUTRITION RESEARCH AND MONITORING SUPPORT (FY1986-95) (\$ in Millions)

	Fiscal Year						1995 estima
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	
5. Nutritional Impacts of Programs							
CSRS	—	—	0.1	0.1	0.1	—	0.1
ERS	0.3	0.3	0.1	0.1	0.1	0.3	0.4
FNS	1.5	0.5	0.5	0.5	2.7	3.8	0.0
TOTAL	1.8	0.8	0.7	0.7	2.9	4.1	0.5
TOTALS							
CSRS	7.9	7.5	7.7	6.9	8.1	10.7	12.3
ARS	37.8	40.6	44.3	45.7	47.9	49.6	49.9
(Former HNIS functions/NAL)	12.8	6.1	7.1	7.7	7.9	8.5	9.0
ERS	0.7	1.2	0.8	0.9	0.9	1.1	1.1
FNS	1.5	0.5	0.5	0.6	2.8	2.3	3.8
USDA TOTAL	60.7	55.9	60.4	61.8	67.6	72.2	76.1
							74.8
							74.7

— Not applicable.

Table 4. USDA Nutrition Education Support (FY 1986-95) (\$ in Millions)

	Fiscal Year									
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 actual	1993 actual	1994 actual	1995 estimate
Extension Service										
Extension (Formula estimate)	15.9	15.9	16.4	16.4	16.4	16.7	17.2	16.9	17.0	17.0
Expanded Food and Nutrition Education Program (EFNEP)	57.6	57.6	58.6	58.6	58.2	60.5	60.5	60.5	61.4	61.4
Intensive Education for WIC	—	—	—	—	—	—	—	3.5	4.3	4.3
TOTAL	73.5	73.5	75.0	75.0	74.6	77.2	77.7	80.9	82.7	82.7
National Agricultural Library										
Food and Nutrition Information Center	0.5	0.4	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8
Nutrition Education Initiative*	—	—	—	—	—	0.1	—	—	—	—
TOTAL	0.5	0.4	0.5	0.7	0.7	0.8	0.7	0.7	0.7	0.8
Agricultural Research Service (former HNIS)										
Guidance and Education Research Branch	—	—	—	—	—	—	—	—	—	—
TOTAL	0.7	0.7	1.2	1.1	1.1	1.4	1.3	1.2	1.8	1.8
Food and Nutrition Service										
Nutrition Education & Training Program (NET)	5.0	5.0	5.0	5.0	5.0	7.5	10.0	10.0	10.3	10.3
Special Supplemental Food Program for Women, Infants and Children (WIC)	52.6	55.4	60.5	66.6	92.5	108.6	125.7	144.1	138.2	151.7
WIC Breastfeeding Promotion	—	—	—	—	9.2	12.4	15.7	24.0	24.0	24.0
Child Nut. Dietary Guidelines	—	—	—	—	—	—	—	2.0	0.0	0.0
Food Service Management Inst.	—	—	—	—	—	—	—	1.3	1.7	1.9
Food Stamp Households	—	—	—	—	—	—	—	1.2	2.3	7.3
Grants for New Ways to Reach	—	—	—	—	—	—	—	—	—	—
Food Stamps Households	—	—	—	—	—	—	—	0.5	0.5	0.0

—Continued

Table 4—Continued. USDA Nutrition Education Support (FY 1986-95) (\$ in Millions)

	Fiscal Year					
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual
Food and Nutrition Service—Cont.						
DFPIR Nutrition Aides Demos (Indian Program)	—	—	—	—	—	0.1
Center/Nutrition Policy	—	—	—	—	—	0.2
WIC Program Studies/Eval.	—	—	—	—	—	0.0
Children Nutrition Programs	—	—	—	—	—	5.0
Nutrition Studies	—	—	—	—	—	3.8
Disabled Child Grants	—	—	—	—	—	0.0
School Meals Init. Spt	—	—	—	—	—	3.3
Kentucky/Iowa Demo	—	—	—	—	—	3.7
Food Stamp Program	—	—	—	—	—	0.0
Research Demo/Eval	—	—	—	—	—	0.0
State Exchange Project	—	—	—	—	—	0.0
TOTAL	57.6	60.4	65.5	71.6	106.7	128.5
Food Safety and Inspection Service						
Nutrition Labeling	0.1	0.1	0.1	0.1	0.1	0.1
Nutrition and Sodium Info.*	0.1	0.02	—	—	—	—
Sodium Monitoring Program*	0.2	0.01	—	—	—	—
FDA/FSIS Labeling Consistency*	—	—	0.1	—	—	—
TOTAL	0.4	0.13	0.1	0.2	0.1	0.1
USDA TOTAL	132.7	135.1	142.3	148.6	183.2	208.0
NUTRITION EDUCATION						
					233.7	267.6
						295.0
						327.9

* Programs discontinued.
— Not applicable.

Table 5. Agricultural Research Service, Human Nutrition Research Support (FY 1986-95) (\$ in Millions)

		Fiscal Year									
		1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 actual	1993 actual	1994 actual	1995 estimate
BHNRC Beltsville, MD		Gross 7.91	8.34	8.42	8.12	8.27	8.69	9.23	9.53	18.47	
Net 7.02		7.41	7.35	7.31	7.48	7.82	8.31	8.31	8.57	16.61	
GFHNRN Grand Forks, ND		Gross 6.36	6.66	7.11	7.03	7.29	7.70	8.07	8.14	8.14	
Net 5.64		5.92	6.32	6.33	6.59	6.93	7.26	7.26	7.33	7.33	
HNRCA Boston, MA		Gross 11.75	12.76	13.68	14.06	14.26	14.56	14.57	14.58	14.58	
Net 11.16		12.12	12.99	13.35	13.54	13.83	13.84	13.84	13.85	13.85	
CNRC Houston, TX		Gross 4.43	5.43	7.65	9.07	10.43	10.43	10.70	10.71	10.70	
Net 3.93		4.88	6.99	8.34	9.63	9.91	10.17	9.76	10.17	10.17	
WHNRC San Francisco, CA		Gross 3.66	4.23	4.49	4.46	4.67	5.02	5.11	5.16	5.16	
Net 3.25		3.76	3.95	4.01	4.22	4.52	4.60	4.60	4.63	4.64	
TOTAL, HN CENTERS		Gross 34.11	37.42	41.35	42.74	44.92	46.40	47.68	47.25	48.12	
Net 31.00		34.09	37.60	39.34	41.47	43.01	44.18	43.77	44.55	52.60	
OTHER ARS											
HN RESEARCH		Gross 3.65	3.18	3.01	2.96	2.96	3.19	2.25	2.47	2.74	
Net 3.24		2.86	2.65	2.66	2.67	2.72	2.03	2.23	2.47	3.30	
TOTAL,											
HUMAN NUTRITION		Gross 37.76	40.60	44.36	45.70	47.87	49.59	49.93	49.72	50.86	
Net 34.24		36.95	40.25	42.00	44.14	45.73	46.21	46.00	47.02	57.49	

Table 6. Other ARS Human Nutrition Research Support (FY1986-95)* (\$ in Thousands)

		Fiscal Year									
		1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 actual	1993 actual	1994 actual	1995 estimate
Beltsville, MD	Gross	—	—	128.7	121.8	116.8	125.1	—	—	—	—
	Net	—	—	111.8	109.6	105.6	106.7	—	—	—	—
Ithaca, NY	Gross	601.3	750.9	765.0	755.4	743.0	785.1	384.5	389.6	485.0	485.0
	Net	533.5	675.9	676.0	679.7	671.8	669.5	346.6	346.6	350.8	436.9
Wyndmoor, PA	Gross	667.1	303.1	—	—	—	—	—	—	—	—
	Net	591.9	272.9	—	—	—	—	—	—	—	—
Peoria, IL	Gross	985.5	982.4	1,017.5	1,007.1	1,068.1	1,144.2	738.4	738.3	749.1	935.8
	Net	874.5	884.3	898.8	906.3	965.8	975.8	665.6	665.6	674.4	842.2
Albany, CA	Gross	959.2	712.7	653.8	493.0	483.9	519.7	530.2	641.1	834.0	1,192.5
	Net	851.1	641.5	576.3	443.6	437.6	443.2	478.0	578.0	750.8	1,074.4
Hyattsville, MD	Gross	433.5	432.7	443.1	580.0	545.3	613.9	600.1	710.8	721.7	—
	Net	384.6	389.5	391.0	521.9	493.1	523.5	541.0	640.7	649.7	—
Headquarters	Gross	—	—	—	—	—	—	—	—	50.0	2,650.0
	Net	—	—	—	—	—	—	—	—	45.0	2,535.0
TOTAL OTHER ARS	Gross	3,646.6	3,181.8	3,008.1	2,957.3	2,957.1	3,188.0	2,253.2	2,474.7	2,744.4	5,263.3
	Net	3,235.6	2,864.1	2,653.9	2,661.1	2,673.9	2,718.7	2,031.2	2,230.9	2,470.7	4,888.5

* Excludes human nutrition centers.

worked to produce a plan to address future information dissemination efforts of the nutrition monitoring program. Members toured and were briefed on state-of-the-art methods for information dissemination at the National Agricultural Library and the Circle, Inc., a contractor of several health clearinghouses. STRIDE completed dissemination of the *Directory of Federal and State Nutrition Monitoring Activities*; and began distribution of *Chartbook I*.

- Survey Comparability Working Group

In 1993, the working group assessed its objectives and direction and met with others to coordinate its activities with overlapping 10-year plan activities. The group initiated work on two reports: (1) nutrition and nutrition-related health questions and (2) knowledge, attitude, and behavior questions. As a result of their coordination activities, the scope and timeframes for the latter were modified to support an ongoing 10-year plan activity. The working group also presented to the IBNMRR for comment a list of variables to be included in its second report on survey comparability, and completed tables and a recommendation for four of these variables.

The group was asked by an EPA representative to assist in that agency's meeting two recommendations of the National Research Council in the report "Pesticides in the Diets of Infants and Children." The recommendations are related to the standardization of intake and survey methodology, food consumption survey coordination, and timing. The working group offered its assistance in researching the comparability of variables prioritized by EPA, and EPA became an official member of the group.

- Food Composition Data Working Group

The working group reviewed 10-Year Plan activities with the intent of identifying new food composition issues that members wished to address. A recommendation that one activity be broadened to cover the need for more information about recipes, retention, and yield factors was made. Several working group members met with representatives of the food industry to discuss the possibility of a series of workshops to address issues related to increasing the use of brand-specific data in the food composition data base. Work continued on HNIS's nutrient data base for trend analysis system, which included a multiyear version of the primary nutrient data set that indicates reasons for changes in nutrient values.

- HNIS/NCHS Analytic Working Group

Activities focused on variance estimation procedures and on criteria used by the National Center for Health Statistics (NCHS) and HNIS for determining when a survey estimate

is stable enough to be published. A subcommittee of HNIS and NCHS staff was formed to develop proposed guidelines for use in reporting 1989-91 CSFII and 1988-91 National Health and Nutrition Examination Survey (NHANES) data in the *Third Scientific Report for Nutrition Monitoring* and in agency publications. The working group also developed a set of suggested reporting guidelines for population descriptors for use in reporting data from the third scientific report and in agency publications.

- Food Safety and Pesticide Exposure

An interdepartmental staff group chaired by HNIS, the Food Safety Working Group, under the Ten-Year Comprehensive Plan for National Nutrition Monitoring and Related Research, prepared two proposals in response to the National Academy of Sciences (NAS) recommendation to increase the sample sizes of children in food consumption surveys. These proposals make use of existing sources of data in order to help EPA meet its data needs for infants and children in the short term. The first proposal called for a special survey of infants and children to supplement the sample sizes in the Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96. The second proposal called for linkage of CSFII 1989-91 and NHANES III intakes data as a means of providing EPA with more accurate estimates of intake data for infants and children.

These proposals were endorsed by USDA's Assistant Secretary for Food and Consumer Services. The Food Safety Working Group, which includes members from EPA, FDA, USDA, DHHS, and Census, has been meeting on a regular basis to define the tasks and timelines needed to implement these proposals.

Work also continued on the specifications and uses of the Food Grouping System. The objective of the system is to expedite analysis of food consumption data as reported in national surveys of food consumption by individuals (CSFII and NHANES) in terms of ingredients or agricultural commodities. Data generated will be available to EPA and FDA for use in their *Dietary Residue Exposure System* and *Total Diet Study*, respectively.

HNIS continued to consult EPA on the nature of the data to be collected in HNIS surveys. Work began on how to improve the reporting of intake data for infants and young children in its upcoming CSFII 1994-96. Moreover, HNIS collaborated with EPA and other Federal agencies to improve and add questions to the CSFII 1994-96 on the source and quantity of water consumed.

- Interagency Committee on Human Nutrition Research

The committee continued to coordinate human nutrition research activities at the Federal level under the leadership

of co-chairpersons, Dr. Bruce Stillings, acting assistant secretary for science and education, USDA (January 1 to March 20, 1993) and Dr. R. Dean Plowman, acting assistant secretary for science and education, USDA (March 23 to December 31, 1993), and Dr. J. Michael McGinnis, acting assistant secretary for health, HHS and Dr. Philip R. Lee, assistant secretary for health, HHS. The executive secretariat of ICHNR has resided for several years at the HHS, NIH, Division of Nutrition Research Coordination where Dr. Darla Danford has been the executive secretary. In February 1993, the secretariat was moved to the ARS, National Program Staff, and Dr. Jacqueline Dupont became executive secretary.

The February 1993 meeting was devoted to a working session on future directions of the committee. The Conference for Federally Supported Human Nutrition Research Units and Centers was considered important and it was planned for February 1994 and every 2 years in the future. The Subcommittee on Isotopes in Human Nutrition Research continued to work with the White House Office of Science and Technology Policy (OSTP) and DOE under the leadership of Dr. Darla Danford. As the OSTP and NIH Division of Research Coordination were being reorganized, the work on isotope needs was transferred to Dr. Barbara Moore. Dr. Moore pursued resolution of the isotope supply problems by discussions with DOE and OMB. The supply shortage and cost of isotopes continues to be a critical issue.

The working group on Reference Materials for Food and Nutrition was very active in 1993. Collaborations were arranged between USDA, National Institute for Standards and Technology (NIST) and the Association of Analytical Chemistry (AOAC) International to standardize and provide methods and reference materials. Scientific discussions at the fall 1993 meeting were held on food, nutrition, and health—reduction of health care costs and dietary shifts and implications for agriculture.

- Dietary Guidance Working Group

The Dietary Guidance Working Group of the Human Nutrition Coordinating Committee, initiated in 1986, continued to review all USDA publications and materials that contain dietary guidance for the general population and to coordinate review of those materials with DHHS. In accordance with the National Nutrition Monitoring and Related Research Act of 1990, the group also reviewed dietary guidance materials produced by DHHS. The review is to ensure that dietary guidance from the Federal Government accurately reflects Federal nutrition policy as expressed in the *Dietary Guidelines for Americans* and to ensure that guidance is supported by valid scientific or medical knowledge. About 25 materials were reviewed during the 1993 fiscal year. A memorandum of understanding between USDA and DHHS to formalize the review

process was under discussion. USDA's group was chaired by HNIS and included representatives from 10 USDA agencies—AMS, ARS, CSRS, ERS, ES, FNIC, FNS, FSIS, HNIS, and Office of Public Affairs (OPA)—and a liaison from DHHS. The group also serves as a means of communication among nutrition education specialists in these agencies.

- USDA/DHHS Nutrition Education Committee for Maternal and Child Nutrition Publications

This committee, established in 1990, meets three times a year. Its purpose is to promote a joint effort between the two Departments on educational materials related to maternal and child nutrition in order to assure consistency of content, avoid duplication, and make more effective use of resources. The committee identified a need to learn more about the influence of culture on nutrition and on the provisions of nutrition education. Several forums featuring nutritionists from different cultures were held to provide information to committee members and other interested individuals in both departments.

- The Federal Interagency Ad Hoc Committee on Health Promotion Through the Schools

The Federal Interagency Ad Hoc Committee on Health Promotion Through the Schools was established in 1983. It is coordinated through the Public Health Service's Office of Disease Prevention and Health Promotion and co-chaired by this office and the Department of Education's Comprehensive School Health Education Program. Representatives from the Departments of Agriculture, Defense, Education, Health and Human Services, Interior, Justice, Transportation, and the Environmental Protection Agency serve as members. The committee meets bimonthly and provides a forum for information sharing among Federal agencies about programs and activities related to school health, and for interagency coordination and collaboration. In late 1992, the committee compiled and published a comprehensive directory of Federal programs and activities related to school health. This directory should prove to be a valuable resource for Federal agencies, Congress, and all those who are involved at the State and local level in planning, implementing, and evaluating school health programs.

- The Interagency Committee on School Health

The Interagency Committee on School Health (ICSH) was established in 1992. Its purpose is to increase the effectiveness of Federal efforts to improve the education and health of school-aged children and youth through the promotion and implementation of school health programs. The committee is co-chaired by the Assistant Secretary for Elementary and Secondary Education in the Department of Education and the Assistant Secretary for Health in HHS. Representatives from the Departments of Agriculture,

Defense, Justice, Interior, Labor, and Transportation join those from the Departments of Education and Health and Human Services.

The committee met biannually to discuss Federal priorities related to school health. At the November 1993 meeting, the Assistant Secretary of Agriculture for Food and Consumer Services briefed the committee on key findings from the school nutrition dietary assessment study and some proposed USDA initiatives for school lunch reform. The committee also heard reports on health care reform initiatives related to school health and on results from an Institute of Medicine study on comprehensive school health education programs.

- National Cholesterol Education Program

HNIS is USDA's liaison to the National Cholesterol Education Program Coordinating Committee. HNIS keeps the committee informed of USDA research results from food consumption surveys regarding dietary status and activities that support the dietary guidelines for Americans.

- Iron Deficiency Prevention, Detection, and Management

HNIS staff presented "Alternative Strategies for Increasing Iron Consumption," to the Food and Nutrition Board's Committee on Prevention, Detection, and Management of Iron Deficiency Anemia Among U.S. Children and Women of Childbearing Age. Representatives from other Federal agencies also made presentations.

- Project To Evaluate Congregate and Home-Delivered Meals

Along with representatives from other Federal agencies in USDA and DHHS, HNIS staff served on a technical evaluation panel that awarded a contract for an Administration on Aging project to evaluate the nutrition services provided under the Older Americans Act of 1965, as amended. In addition to congregate and home-delivered meals, the law authorizes the provision of nutrition education, shopping assistance, information and referral services, and recreational and social activities.

- Task Force on Aging Research

An HNIS staff member served on a technical working group of the task force on aging research. This member summarized the lifestyle section (exercise, diet and nutrition, and substance abuse) as part of a report to be submitted to the task force. The task force is Congressionally mandated to recommend to the Secretary of DHHS and Congress what types of aging research ought to be done or supported by DHHS.

- Consensus Workshop on Dietary Assessment

HNIS staff members served on the planning committee for the Consensus Workshop on Dietary Assessment: Nutrition Monitoring and Tracking the Year 2000 Objectives. They attended the workshop on February 21-24, 1993, in Richmond, VA, and participated in follow-up activities.

- Pesticide Data Program

The pesticide residue monitoring program, instituted by AMS in May 1991 as part of USDA's pesticide data program, is designed to provide information on residues in the nation's food supply and is used for risk assessment. In 1993, AMS collected approximately 8,700 samples, generating 35,000 analyses (almost double that of 1992) and reported over 60 different residues. As of January 1994, there were over 40 pesticides of priority to EPA in the program, including 4 multiresidue testing methods and 5 single pesticide methods. EPA will use the data in setting pesticide tolerance levels, while other Federal and State agencies and other interested organizations will use the information in determining policies intended to safeguard public health. Standard operating procedures based on EPA's good laboratory practices were finalized. Program rationale incorporated many of the recommendations for residue testing programs stated in the National Academy of Sciences' report, "Pesticides in the Diets of Infants and Children." Sampling includes 12 commodities, five of which are highly consumed by children.

- U.S. Plan of Action for Nutrition Steering Committee

A steering committee with representatives from the Agency for International Development, DHHS, and USDA began in 1993 to coordinate development of the U.S. plan of action for nutrition. This plan is being prepared in follow-up to the December 1992 International Conference on Nutrition. When final, the plan will be submitted to the Food and Agricultural Organization of the United Nations and to the World Health Organization.

- Food Security Interagency Working Group

The Food Security Interagency Working Group was formed in 1993 in order to put into action activity V-C-2.4 in the Ten-Year Comprehensive Plan for Nutrition Monitoring and Related Research. This activity is to "establish as a routine research component a standardized mechanism, instrument, and methodology for defining and obtaining data on the prevalence of food insecurity, or food insufficiency, in the U.S. that can be used across various Federal agencies and at the State and local level."

The group is led by representatives from FNS and the HHS National Center for Health Statistics. Publications planned for 1994 included proceedings from the Food Security

Measurement and Research Conference, which took place in January that year.

B. Coordination Within USDA

1. General

On January 13, 1993, a revised structure for coordination of the USDA human nutrition programs was established. Under the Secretary's Office Policy Coordination Council, a Human Nutrition Policy Committee was established. It was co-chaired by the Assistant Secretaries of Science and Education and Food and Consumer Services, and all agency heads with programs related to nutrition are members. The committee interfaces with other government agencies including ICHNR and IBNMRR. Under the committee, the Human Nutrition Coordinating Committee, with an ARS representative as chair and an FNS representative as vice chair, was defined. Its members are the agency heads' technical representatives and an HHS liaison. Working groups are established under the coordinating committee as needed. In 1993, the Dietary Guidance Working Group was a standing committee. The responsibilities and operating procedures of the committee structure were defined in a memo from the Deputy Secretary to the Assistant Secretaries and agency heads.

2. Extension Service Collaboration

In conducting CES nutrition education programs, the staff reach out to diverse agencies and organizations, such as the food stamp program, Kiwanis International, and health departments. Because of recent emphasis in the EFNEP program to reach pregnant and parenting women and adolescents, the staff collaborated with WIC, as well as the Healthy Mothers, Healthy Babies National and State Coalitions, the National Commission to Prevent Infant Mortality, the Breastfeeding Consortium, and the Maternal and Child Health Interorganizational Nutrition Group.

Over the past 5 years, approximately 40-45 percent of the total EFNEP clientele also received WIC benefits. Cooperation has varied from cross-referral systems, conduct of classes at WIC clinics, and shared training sessions. This experience provided a base in working together and also identified areas for improvements.

For fiscal year 1993, there is new funding for a WIC nutrition education initiative. The goals of this initiative are to increase interagency collaboration; to improve knowledge and behavior in areas such as food selection, purchasing, storage, safety, and preparation; and to improve breastfeeding and dietary behaviors. To implement this initiative, ES is providing funds to States in two ways. All States and territories were eligible to receive \$30,000 based on an approved plan of work. Plans from the 50 States and 5 territories were reviewed and approved. One of the

primary purposes of the funds is to increase the interagency collaboration between CES and WIC. Through the process of jointly developing the plan of work, the local staff identified the needs of clients and developed strategies for meeting these needs.

In addition, there were opportunities to submit competitive proposals for projects up to \$100,000. Over 30 responses were received. These larger projects identified more innovative approaches to delivering intensive nutrition education and encouraged working with other community-based organizations that are also addressing maternal and infant health needs, such as the DHHS Healthy Start Program, the Plight of Young Children Initiative, Weed and Seed, and Healthy Children Ready to Learn.

At both funding levels, the plans and proposals were jointly developed between ES and WIC State or local staff. This joint planning included the identification of the target audience, focus of the nutrition education, training to be conducted, and evaluation methodology.

The projects submitted for the competitive proposals were diverse. There was a mix of urban and rural settings, as well as audiences to be reached. These include Southeast Asians, such as Vietnamese and Cambodian; African-Americans; recent immigrants, such as Haitians; various Hispanic subgroups, such as Mexicans, Puerto Ricans, and Central Americans; Native Americans; Pacific Islanders; and rural, white populations in Appalachia. Low-literacy, substance-abusing, and battered women were also among the target audiences. Different physiological states, including pregnancy, lactation, infancy, and early childhood, were included, for general as well as specific topics. The delivery modes included such innovations as the use of a mobile van, interactive compact disks or interactive computer programs, distance learning opportunities, as well as the somewhat more usual group and home visiting.

Following an extensive review and evaluation process to select the most promising projects using the joint efforts of ES and FNS staff, 17 projects were selected for funding.

- Extension Targets Vulnerable Audiences

There were many efforts in ES to target vulnerable audiences. Each program had its unique features, while building on the strengths of other programs also underway.

- CES/ES/HNIS Cooperation on Nutrition Education Information Needs

Through a memorandum of understanding initiated in 1987, ES and HNIS are working together to achieve common goals in nutrition education. A CES/ES/HNIS consulting group meets periodically through teleconferences and once a year face to face. The purpose of the group is to (1) make CES staff aware of the kinds of publications and products

HNIS produces; (2) advise HNIS how CES uses these publications and products and how they might be modified to be of greater use to CES; and (3) discuss the kinds of research CES would like HNIS to undertake in their area of expertise. The group exchanges information between Federal and State agencies to keep each aware of the other's needs and to avoid duplication.

- Nutrition Impact Indicator Project

HNIS awarded a grant to facilitate the nutrition impact indicator project of CES. The nationwide data collection effort focuses on the development and use of indicator questions that examine knowledge and behavior of adults participating in CES diet, nutrition, and health programs. Measurement tools were developed for four of the Dietary Guidelines for Americans: (1) eat a variety of foods; (2) maintain healthy weight; (3) choose a diet low in sat, saturated fat, and cholesterol; and (4) choose a diet with plenty of vegetables, fruits, and grain products. HNIS will participate in workshops to evaluate the data collected and plan future data collection efforts.

- HNIS and ERS Cooperation on Food Supply Data

HNIS and ERS cooperate in publishing information on the U.S. food supply. ERS produces the data on amounts of foods consumed, and HNIS uses those data to generate estimates of the nutrient content of the food supply. In accordance with the 10-year plan for nutrition monitoring, HNIS and ERS are cooperating on finding ways to increase use and understanding of the food supply data. Additionally, HNIS and ERS are working closely to reconcile any data discrepancies due to differences in methodologies.

3. Cooperative Regional Research Projects

CSRS administers Hatch and Evans-Allen Funds to support cooperative human nutrition research involving land-grant institutions and the 1890 colleges and universities. These projects are regional and may involve ARS, ERS, and HNIS scientists. The active regional projects in human nutrition are listed following and specific objectives described:

- Western Regional Research Project (W-143)—Nutrient Bioavailability: A Key to Human Nutrition

Understanding is limited of the dietary factors that affect the digestion and absorption of available form of nutrients, especially vitamins and minerals. Since some of the nutrients (iron, calcium, pyridoxine, folacin) most affected appear to be marginal or low in the diets of certain population subgroups, data on bioavailability becomes of critical importance in establishing sound dietary requirements and in appraising dietary adequacy. The objectives are to (1) determine the bioavailability of vitamins and minerals in plant- and animal-derived foods in human subjects, and (2)

develop methods for determining bioavailability of dietary factors in vitro and in animal models for predicting human bioavailability. This project involves 13 universities, the Western Human Nutrition Research Center, and two representatives from industry.

- North Central Regional Research Project (NC-167)—Health Maintenance Aspects of Dietary Recommendations Designed To Modify Lipid Metabolism

The objectives of this project are (1) to determine the effects of changes in the quantities and ratios of dietary fatty acids on physiological factors influencing health maintenance; (2) to determine the impact of diets which meet the dietary guidelines, (especially with regard to fat and fiber content) on aspects of lipid, lipoprotein, and energy metabolism that influence health maintenance, and (3) to assess the impact of diets which meet the dietary guidelines on minerals and electrolytes that affect lipid metabolism and health maintenance. This study involves collaboration among 16 universities and two ARS centers.

- Northeast Regional Research Project (NE-172)—Nutritional Assessment of Older Adults: Diet Intake and Biochemical Studies

The objectives of this regional project are to (1) assess the validity of methods of determining food intake and study factors affecting food intake in older adults; (2) evaluate biochemical methods for measuring iron, magnesium, protein, and amino acid status of older adults; and (3) compare and integrate biological, cultural, and sociological measurements as indices of nutritional status in the elderly. This project involves researchers from nine States, ARS, and HNIS.

- North Central Regional Research Project (NC-200)—Behavioral and Health Factors That Influence the Food Consumption of Young Adults

The objectives of this project are to (1) identify traits, behaviors, concerns, and perceptions that influence the food consumption decisions of young adults, and (2) determine the influence of cultural, behavioral, and perceptual factors, and their interactions on the diet of young adults. This project involves collaboration among scientists from eight universities, and HNIS.

- Western Regional Research Project (W-182)—Dietary Fat and Fiber: Knowledge, Perceived Risks, and Dietary Practices

Five objectives are addressed in this project: (1) to determine respondents' knowledge and understanding of the dietary guidelines for fat and fiber; (2) to determine the degree to which respondents are following the recommended guidelines; (3) to examine respondents' perception

of health risks associated with intake of fat and dietary fiber; (4) to identify constraints to, and motivating factors for, following these guidelines in relation to population characteristics; and (5) to determine differences between respondents in the general population and those medically defined at risk with respect to knowledge and understanding of the dietary guidelines for fat and fiber, perception of associated health risks, and compliance with dietary recommendations. Twelve universities and HNIS are involved.

- Southern Regional Research Project (S-216)—
Changing Patterns of Food Demand and Consumption
Behavior

The objectives of this project are to (1) develop and evaluate data bases in order to understand food demand and consumption behavior; (2) estimate food demand parameters with alternative theoretical and applied models; (3) measure, assess, and interpret changing patterns of food demand and consumption behavior in order to analyze food policies, food programs, consumer protection (for example, food safety), and consumer education; and (4) identify and assess changing patterns of food demand and consumption behavior in selected countries in order to improve understanding of food demand in U.S. export markets. This project involves about 23 agriculture economics departments, Agriculture Canada, Bureau of Labor Statistics, ERS, and HNIS.

- Western Regional Research Project (W-122)—
Improve Food Safety Through Discovery and Control
of Natural and Induced Toxicants and Antitoxicants

In addition to assessing the risks of toxicants in food, the researchers plan to identify and investigate mechanisms of action of food-borne antitoxicants that may reduce risks to human health. Ten States and the Western Regional Research Center participate.

- 1890 Regional Research Project (RR-6)—Evaluation
of Effective Intervention Methods to Improve the
Quality of Well-Being of Rural Elders

Most departments of human ecology within the 1890 university system are participating in this multidisciplinary project. One objective addresses the effectiveness of dietary management programs on the nutritional practices and diet behavior of older persons.

- Northeast Regional Research Project (NE-165)—
Private Strategies, Public Policies, and Food System
Performance

The Food Marketing Policy Center at the University of Connecticut is associated with the project. Two research projects address nutrition issues. They are (1) use of

nutritional labels in consumers' preferences and product choices, and (2) effect of firm strategic response to food safety and nutrition regulation on competition in food markets. The committee held a conference on valuing food safety and nutrition on June 2-4, 1993.

C. Coordination With the Private Sector and International Organizations

- The Nutrition and Food Safety Education Task Force

This task force was established in 1985, as a continuation of the Sodium Education Task Force, to focus on broader issues in nutrition and food safety. The task force meets several times a year to share resources and information. Members include Federal agencies, such as HNIS and FSIS, DHHS's National Heart Lung and Blood Institute, National Cancer Institute, and FDA; industry groups, such as the International Food Information Council, the Food Marketing Institute, the National Food Processor's Association, the Grocery Manufacturer's Association, and the National Restaurant Association; and consumer groups, such as the Center for Science in the Public Interest, Public Voice for Food and Health Policy, and the American Association for Retired Persons. Because new food labeling regulations became effective in May 1994, recent meetings of the task force focused on discussion of food labeling education projects.

- National Organic Standards Program

Recommendations for a certification program in accordance with the National Organic Standards Act of 1990 were developed by the National Organic Standards Board working with AMS. The board comprises farmers, handlers, retailers, consumers, scientists, and environmentalists. Its proposals in the areas of crop standards; livestock standards; processing, handling and labeling; materials; accreditation; and international concerns are being reviewed by the industry before they are presented to USDA.

- Breastfeeding Promotion Consortium

USDA hosts ongoing semi-annual meetings of the Breastfeeding Promotion Consortium to exchange information on how government and private health interests, including major professional health organizations, can work together to promote breastfeeding and to explore and implement joint efforts. Over 25 organizations participate in the consortium, including DHHS, the American Academy of Pediatrics, the American Nurses Association, and the Healthy Mothers, Healthy Babies Coalition. The consortium meets semi-annually in Washington, DC, and convened in June 1990, February and August 1991, and March 1992. At the consortium's recommendation, the Department developed plans for a national campaign to promote

the concept that breastfeeding is the optimum choice for infant feeding for mother and baby. Public Law 102-342, enacted August 1992, requires USDA to develop such a campaign and authorizes the Department to finance it with donations from outside sources.

- Baby-Friendly Hospital Initiative

USDA is involved with the Baby-Friendly Hospital Initiative, jointly sponsored by the United Nations International Children's Fund (UNICEF) and the World Health Organization, to encourage hospitals in countries around the world to promote breastfeeding and provide breastfeeding support services by implementing 10 essential steps. USDA is coordinating with UNICEF, DHHS, and various nongovernment groups to implement this initiative in the United States.

- The Nutrition Education Task Force

This task force was established in 1985, as a continuation of the Sodium Education Task Force, to focus on broader issues in nutrition and food safety. The task force meets several times a year to share resources and information. Members include Federal agencies, such as HNIS and FSIS, DHHS's National Heart Lung and Blood Institute, the National Cancer Institute, and FDA; industry groups, such as the International Food Information Council, the Food Marketing Institute, the National Food Processor's Association, the Grocery Manufacturer's Association, and the National Restaurant Association; and consumer groups, such as the Center for Science in the Public Interest and Public Voice.

- Food Supply Information

ERS and HNIS cooperate with many commodity trade organizations, industry groups, and university experiment stations in the process of collecting and analyzing food production and consumption data. Many procedural changes eventually instituted by ERS and HNIS are first submitted to such expert groups for comments.

ERS and HNIS also provide the U.N. Organization for Economic Cooperation and Development with U.S. data concerning the food supply.

D. Advisory Groups

- National Nutrition Monitoring Advisory Council

The National Nutrition Monitoring Advisory Council was established by an executive order of the President in 1991, pursuant to P.L. 101-445. The nine-member council provides scientific and technical advice on the development and implementation of the coordinated program and comprehensive plan for the National Nutrition Monitoring

and Related Research Program. The council serves in an advisory capacity to the Secretaries of USDA and DHHS. The council met May 18-19 and October 19-20, 1993, in Washington, DC. During its second year of operation, it explored (1) the data needs of state-level users of nutrition monitoring data from across the nutrition monitoring program; (2) the Federal budget process, and how nutrition monitoring priorities are incorporated into this process; and (3) the data needs and uses of Congressional staff from committees with jurisdiction over nutrition monitoring. The council summarized the conclusions and recommendations in a report to the Secretaries.

- National Advisory Council on Maternal, Infant, and Fetal Nutrition

The National Advisory Council on Maternal, Infant, and Fetal Nutrition met October 20-22, 1993, to develop a report on issues relevant to the Special Supplemental Food Program for Women, Infants, and Children (WIC) and the Commodity Supplemental Food Program. These issues included WIC full funding, funding formulas, allowable costs, purchase of breast pumps, the Baby-Friendly Hospital Initiative, folate, Healthy Start, and vendor management incentives. Recommendations adopted by the council were included in its 1994 biennial report to the President and Congress. The council met again in the fall 1994.

- Human Nutrition Board of Scientific Counselors (HNBSC)

HNBSC was not funded for 1993.

